

OGDEN ARSENAL
(Ogden Ordnance Depot)
(Ogden Sub Depot of Tooele Ordnance Depot)
(Hill Air Force Base)
North of State Highway 193, East of State
Highway 126 and Interstate 15, South of
the Davis-Weber Canal
Layton Vicinity
Davis County
Utah

HAER No. UT-84

HAER

UTAH

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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED MEASURED DRAWINGS

HISTORIC AMERICAN ENGINEERING RECORD
Rocky Mountain System Support Office
National Park Service
P.O. Box 25287
Denver, Colorado 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

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**OGDEN ARSENAL
(OGDEN ORDNANCE DEPOT)
(OGDEN SUB DEPOT OF TOOEELE ORDNANCE DEPOT)
(HILL AIR FORCE BASE)**

HAER No. UT-84

Location: **NOTE:** For shelving purposes at the Library of Congress, the Layton vicinity in Davis County was selected as the 'official' location for the Ogden Arsenal. However, the Ogden Arsenal is also located in the Ogden vicinity, Weber County. North of State Highway 193, East of State Highway 126 and Interstate 15, South of the Davis-Weber Canal, Layton Vicinity, Davis County, Utah

Quads: Clearfield, Kaysville, Ogden, and Roy

UTM: 12-414740-4552680
12-414740-4552980
12-417280-4552980
12-417280-4555080

Dates of Construction: 1919-1921, 1935-1938, 1939-1942

Present Owner: Ogden Air Logistics Center at Hill Air Force Base
Ogden, UT 84056

Present Use: Buildings are currently the property of Ogden Air Logistics Center at Hill Air Force Base, UT

Significance: The Ogden Arsenal was the first major defense installation constructed in Utah during the twentieth century. Unlike nineteenth-century garrisons, the Arsenal's construction marked Utah's first installation established to receive, store, ship, manufacture, and repair war materiel.

Following World War I, the War Department decided to disperse munitions to the west. Because of geography and rail facilities, Ogden seemed ideal. The U. S. Army Ordnance Department completed initial construction in October 1921; the Arsenal began storing munitions that same month. After only two years, as the possibility of war receded, the Arsenal sank into disuse. Then, in 1935, in response to the conquests of Axis powers in Europe and Asia, the Ordnance Department

decided to rebuild the Arsenal into a major storage and manufacturing facility. Construction began as a Works Progress Administration (WPA) project, and continued as war engulfed the world.

During World War II, Arsenal employees loaded artillery shells and aerial bombs and linked small arms ammunition. Workers also received, stored, and shipped munitions; ordnance and transportation equipment; and parts, supplies, and tools to the western United States and the Pacific Theatre. The base reached an employment peak of 6,600 in 1942.

Following World War II, the Arsenal sold surplus materiel as employment declined to under 1,500. With the outbreak of the Korean War, employment again rose as workers manufactured munitions and supplied war materiel to American troops.

After the end of the Korean War, the Army needed more space than the Arsenal location allowed, while the Air Force needed to expand nearby Hill Air Force Base (HAFB). The Army transferred most facilities to HAFB on April 1, 1955, and ordnance functions moved to Tooele Ordnance Depot.

Project Information:

Hill Air Force Base, represented by Debbie Hall, sponsored this HAER project. The National Park Service, Rocky Mountain System Support Office administered this project under the direction of historian Elizabeth Wegman-French. Roger Roper of the Utah State historical Society assisted in coordination. Dr. Thomas G. Alexander, the Lemuel Hardison Redd, Jr. Professor of Western American History, Brigham Young University researched and wrote the historic context and overview report up through page 48; Jeff Malcomson wrote the subsequent pages. Mary Troutman, University of Utah, researched and wrote the technological information and individual building reports; architectural descriptions were based on work by Hardlines: Design & Delineation. Drawings were delineated by the office of Hardlines: Design & Delineation of Columbus, Ohio; and by Kayla S. Leyde, University of Utah under the direction of Burtch W. Beall, FAIA and Dr. Thomas R. Carter.

Richard Dockendorf photographed the resources. Art Olivas of Hill AFB facilitated the logistics at the base. Dr. Donald W. Klinko, Jr., Historian, Ogden Air Logistics Center supplied much of the data for this report.

The First World War, American Interests, and the Background of the Ogden Arsenal

Although the United States had fought wars with England, Mexico, and Spain in the nineteenth century, America's citizens and governmental leaders had chosen to avoid what George Washington in his farewell address had called "permanent alliances," and what Thomas Jefferson called "entangling alliances." In April 1917, Woodrow Wilson asked Congress to bend that policy. In 1914, what historian Barbara Tuchman called The Guns of August blasted Europe's Central Powers--Germany and Austria-Hungary into war with the Allied Powers--Great Britain, France, Russia, and after 1915 Italy.¹

Although the United States remained neutral until April 1917, the Wilson Administration initiated a preparedness campaign.² Tightening federal control of the national guard, the United States began to stockpile munitions and to increase the size of the navy. At the same time, the administration floated diplomatic initiatives to negotiate an end to the war while struggling to maintain American neutrality.

As the fighting expanded, both Great Britain and Germany violated American neutrality by interfering with American shipping. Britain, however, used conventional methods by blockading the shipment of munitions to Germany. Although the British infringed on America's neutral rights by detaining innocent people and preventing the shipment of civilian supplies, they did not actually kill Americans or destroy American property.

Germany, on the other hand, with a smaller surface navy than Britain could not sustain an effective blockade of the British Islands or of France. As a substitute the Germans sent a shiver of fear into belligerent and neutral alike by dispatching submarines to sink Allied ships within a declared war zone. The torpedoing of the British liner Lusitania on May 7, 1915 led to a strong American protest and to the temporary stopping of submarine attacks on passenger ships.

In late January 1917, however, Germany declared unrestricted submarine warfare. Recognizing that the United States would probably go to war under these circumstances, Germany gambled that it could defeat the Allies before America could mobilize, train, supply, transport, and field enough troops to bolster the sagging Allied defenses.

After the Lusitania sank, Wilson broke diplomatic relations with Germany. He did not ask for a declaration of war until April 2, 1917 following the sinking of several American ships and the loss of American lives and property. Coincident with the sinkings, American

¹Barbara Wertheim Tuchman, The Guns of August (New York: Macmillan, 1962).

²For America's role in World War I see Ernest R. May, The World War and American Isolation, 1914-1917 (Cambridge: Harvard University Press, 1959); Arthur S. Link, Wilson the Diplomatist: A Look at His Major Foreign Policies (Baltimore: Johns Hopkins Press, 1957); and Frederick S. Calhoun, Power and Principle: Armed Intervention in Wilsonian Foreign Policy (Kent, OH: Kent State University Press, 1986).

newspapers intercepted and published a telegram in which German foreign minister Arthur Zimmermann proposed a German-Mexican alliance which promised the return to Mexico of territory the United States had conquered during the Mexican War.

Ever wary of American sentiment against entanglement with foreign powers, the Wilson administration retained the fiction of independence by referring to the United States as an "Associated Power" rather than as one of the Allies. Nevertheless, American troops fought in Allied units, particularly in eastern France where they assisted in blunting the German drive to win the war. American pilots also flew principally French-built airplanes.

At home, World War I inaugurated unprecedented change in American society.³ African Americans poured from southern farms into north eastern cities to work in burgeoning military installations and war plants. About a million American women also entered the labor force. Millions of additional women engaged in Red Cross service and other humanitarian endeavors. Most American women quickly retired from the labor force following the war, but some remained in the marketplace where they began to tear the Victorian pattern of the husband as breadwinner and the wife as homemaker.

The United States concentrated its troops on the European Western Front. As a result, munitions and materiel flowed toward Atlantic ports. In the process eastern ports of embarkation, manufacturing plants, military posts, and materiel and munitions storage facilities abounded.

The war ended with the armistice of November 11, 1917, just over a year and a half after the United States declared war on Germany. Since the United States no longer needed war materiel in Europe, shipments of munitions and other supplies backed up in depots and arsenals on the Atlantic coast. Moreover, war materiel from the European front flowed back to these same storage facilities. A virtual gridlock of munitions piled up in Atlantic coastal ports and the War Department found it necessary not only to utilize all available storage space at conventional arsenals but also to convert manufacturing plants into temporary storage depots.⁴

The location of such a large mass of munitions on the east coast presented several problems. Residents of thickly settled seaboard communities, especially those living near

³For life on the homefront see David M. Kennedy, Over Here: The First World War and American Society (New York: Oxford University Press, 1980).

⁴"Ogden Arsenal History, June 1920-1943," (TMs, [photocopy]: n.p, n.d.), 1, in Carrier 10, Tray 1, Ogden, Arsenal, Miscellaneous data and Histories, 1920-1945, On File at Office of History, Ogden Air Logistics Center, Hill AFB, Utah. Hereinafter Arsenal data in Carrier 10 will be cited as "Arsenal Miscellaneous data, HAFB History Office." Newton D. Baker to Secretary of the Treasury, January 8, 1920, Adjutant General Project Files--17-25, RG 407, Adjutant General's Office, Central Decimal Files, Project Files, 1917-1925, Depots, Box No. 1407, National Archives, Washington D. C.

munitions stored under less than ideal conditions, began to demand that the War Department remove the explosives from their neighborhoods.⁵

At the same time, strategic and logistic considerations made such a concentration on the east coast extremely unwise. The United States had learned of its appalling military weakness in its lack of adequate preparation for World War I.⁶ Shipments to the European theatre had seriously depleted supplies of munitions in the Midwest, on the West Coast, and in the Pacific. Under the circumstances, the potential threat of Japan to our interests in the central and Western Pacific may have played a role in the decision to move some of the munitions to the west.

In the two decades between 1890 and 1910 Japan emerged as the major Asian military power. Japan defeated China in 1895 and Russia in 1905. Many Japanese believed that the Treaty of Portsmouth negotiated by Theodore Roosevelt to end the Russo-Japanese War had given them less than they deserved, and they resented the United States for thwarting what they perceived as the just rewards of their victory. Moreover, California had insulted the Japanese by segregating its public school system; and the United States further abused these proud people through Roosevelt's Gentlemen's Agreement which prohibited the immigration of laborers from Japan to the United States.

Nevertheless, the United States respected Japan's military power, and the Taft-Katsura and Root-Takahira executive agreements during Roosevelt's administration acknowledged Japan's primary interest in Korea, Manchuria, and North China. In these same agreements, Japan recognized our right to trade in China and our interest in the Philippines. The Japanese had also fought as a co-belligerent with the United States and the Allies during the First World War. Still, largely untouched by the war and anxious to expand their empire, the Japanese had emerged as the most powerful nation in the western Pacific and east Asia, and thus as a potential threat to American interests in the region.⁷

⁵Baker to Secretary of the Treasury, January 8, 1920, AG Project Files 17-25.

⁶Constance McLaughlin Green, Harry C. Thomson, and Peter C. Roots, United States Army in World War II: The Technical Services, The Ordnance Department: Planning Munitions for War (Washington D. C.: Office of the Chief of Military History, Department of the Army, 1955), 30.

⁷A history of the Ogden Arsenal written in 1943 argues that "there was a serious threat of war with Japan at that time." "Ogden Arsenal History, June 1920-1943," 1, Arsenal Miscellaneous data, HAFB History Office. This judgment is probably colored by conditions during World War II. I have found nothing in planning documents in the National Archives from 1919 and 1920 which indicate that planners considered Japan a "serious" threat. Nevertheless, military strategists undoubtedly planned for the possibility of war with Japan and munitions on the east coast could certainly not have been of much service during such a conflict.

Recognizing that prudence dictated the need for war munitions at points other than the east coast, the Chief of Ordnance, Maj. Gen. Clarence C. Williams appointed a Munitions Board to determine the optimal distribution of various types of war materiel. After an investigation, the board recommended that the United States should move sixty percent of the munitions to Savanna Ordnance Depot in northwestern Illinois, leave twenty-five percent at five depots on the east coast in forwarding centers designed for overseas shipments, and store at least fifteen percent at a new arsenal in the west at a site with convenient rail connections to the Pacific Coast. Given these conditions, as early as June 13, 1919, Ordnance Department planners had concluded that because of the exceptional rail facilities, an arsenal somewhere near Ogden or Salt Lake City would serve the purpose.⁸

The full role Utah's Senators, Reed Smoot and William H. King played in the selection of the site is uncertain. King lobbied to have one of the arsenals located near Ogden, hoping at first to induce the Navy Department to store its munitions there as well. The Navy wanted its own arsenal, and Congress eventually designated the Utah site for the storage of Army Ordnance Department munitions alone.⁹ King also served as a witness for the document granting easements for power transmission lines across Davis County property.¹⁰

On August 29, 1919 Secretary of War Newton Baker approved the recommendation to disburse munitions that had piled up in the eastern depots and the War Department sent a team from the Ordnance Department Field Service's Construction Division to find a site. Following World War I, the Ordnance Department's reorganization had divided the department's operations into two functions: Manufacturing Service and Field Service. The Field Service bore responsibility for the operation of all storage depots, maintenance and issue of equipment to troops, and salvage operations.¹¹ Field Service representatives inspected potential sites in Wyoming, Colorado, Nevada, and Utah. In October the investigators recommended a site near Ogden. Baker approved the recommendation, and on

⁸Section tabbed, "Ogden," in "Vol. 4,[of 5 volumes] Ordnance Depot Planning Record, 1917, 1918, 1919-1920," Ordnance Depot Planning and Administration During World War I, 1917-1920, Box No 1, RG 156, Washington National Records Center, Suitland Maryland.

⁹U. S. Air Force, Materiel Command, Ogden Air Logistics Center, "Cultural Resource Management Plan for Hill Air Force Base, Utah," prepared by Hardlines: Design & Delineation (Hill Air Force Base: 1995), II-14.

¹⁰"The United States of America, Electric Power Transmission Line Easement," Folder entitled "01.1 DOD Instl Utah: Ogden Arsenal: Electrical Power Lines Easement," Arsenal Miscellaneous data, HAFB History Office.

¹¹Green, Thomson, and Root, Planning Munitions for War, 34.

January 8, 1920, he asked Secretary of the Treasury Carter Glass to request an appropriation of \$100,000 in a deficiency appropriation bill for the purchase of land.¹²

At first, the War Department found it difficult to induce Congress to approve the Ogden site. Possibly as an economy move, Iowa Congressman James W. Good, chair of the House Appropriations Committee, tried to get the War Department to store all the munitions at Savanna Ordnance Depot. The Ordnance Department lobbied to convince Good that logistic considerations required a site nearer the west coast than Savanna. Department representatives hoped to persuade Good that even if Congress would not approve the entire appropriation for an arsenal in Utah the legislation should at least authorize the construction of high explosive magazines to relieve the overcrowding on the east coast and to locate weapons closer to Pacific ports of embarkation.¹³

Appropriation bills must originate in the House of Representatives, but the Senate can amend them. A number of factors including possible contests for the pork and fear of potential explosions led to attempts to store the munitions at other sites. Some sentiment surfaced to store munitions near Sparta, Wisconsin, but Wisconsin Senator Irvine Lenroot secured an amendment providing that the War Department could use none of the appropriation for the construction of high explosive storage near Sparta. Interested parties promoted the use of Fort Wingate, near Gallup, New Mexico, but the lack of adequate rail facilities on the Atcheson, Topeka, and Santa Fe doomed that proposal. After Congress had laid these considerations aside, the deficiency appropriation bill passed with an appropriation of \$98,000 for the purchase of land for ammunition storage near Ogden.¹⁴

¹²Section tabbed, "Ogden," in "Vol. 4,[of 5 volumes] Ordnance Depot Planning Record, 1917, 1918, 1919-1920," Ordnance Depot Planning and Administration During World War I, 1917-1920, Box No 1, RG 156, Washington National Records Center, Suitland Maryland. Ora Bundy, "Completion Report on the Construction of Buildings and Utilities at the Ogden Arsenal, Utah Under Lump Sum Contract by the W. M. Sutherland Building and Contracting Co., St. Louis Mo.," (n.p., October 15, 1921), 5-6, in Office of the Quartermaster General, Construction Division, Completion Reports, 1917-1919, Norton Airfield, Ohio to Fort Oglethorpe, GA, Box 210, RG 92, Washington National Records Center, Suitland, Maryland.

¹³Section tabbed, "Ogden," in "Vol. 4,[of 5 volumes] Ordnance Depot Planning Record, 1917, 1918, 1919-1920," Ordnance Depot Planning and Administration During World War I, 1917-1920, Box No 1, RG 156, Washington National Records Center, Suitland Maryland.

¹⁴Section tabbed, "Ogden," in "Vol. 4,[of 5 volumes] Ordnance Depot Planning Record, 1917, 1918, 1919-1920," Ordnance Depot Planning and Administration During World War I, 1917-1920, Box No 1, RG 156, Washington National Records Center, Suitland Maryland. Congressional Record 66th Congress, 2nd Session, February 19, 1920, p. 3126; 41 U. S. Statutes at Large 510 (March 6, 1920).

Advantages of the Ogden Site

Geography, geology, and logistics combined to make the site near Ogden ideal as a munitions storage facility. The nearest rail connection lay with the Bamberger railroad company directly west of the proposed site and on the east side of the small Davis County town of Sunset. Doubled tracked and electric powered, the Bamberger ran hourly passenger trains and frequent freight service between Salt Lake City and Ogden. A half mile to the west of the site, the Union Pacific's Oregon Short Line subsidiary operated a line providing service to the east through Omaha and west to the Pacific Coast at Los Angeles and at Seattle. The Southern Pacific, with a major terminal at Ogden also offered a connection to San Francisco as did the Western Pacific with its terminal in Salt Lake City. Moreover, the Denver and Rio Grande with its tracks a mile west of the Arsenal site had located its western terminus at Ogden. Thus, the D and R G afforded additional connections to Salt Lake City and to the east through Denver.¹⁵

The site chosen lay about seven miles south of Ogden and just east of Sunset and State Highway 126. The landscape offered a flat plateau of extremely sandy soil backed by a gradual slope toward the Wasatch Mountains to the east. At the time, no dwellings existed for a mile and a half in all directions from the site. In pre-Weber Basin Project days, farmers had not irrigated the bench land east of the site; they eked out a hardscrabble existence through dry farming. Owing to inadequate rainfall, dry farming had proved quite chancy on the bench east of Sunset. In a valley about a mile and a half to the north lay the Weber River, which often dried up during the fall. To the west, the bench dropped off approximately 300 feet to an irrigated agricultural valley which stretched west of Sunset and toward Roy to the north and Clearfield to the south. By the end of World War I, the rapidly urbanizing Wasatch Front offered a stable market to farmers who grew truck crops and fruit trees and operated dairy farms.¹⁶

Geology of the Arsenal Site

The site owed its surface condition to Pleistocene Lake Bonneville and to the Weber River. During the late Pleistocene Epoch between 30,000 and 10,000 years ago, Lake Bonneville covered most of the Great Basin portion of western Utah. Its waters lapped the

¹⁵Bundy, "Completion Report," 7; "Ogden Arsenal History, June 1920-1934," Part 1, 2-3.

¹⁶Bundy, "Completion Report," 6-7; "Ogden Arsenal History, June 1920-1943," Part 1, 2-3, Arsenal Miscellaneous data, HAFB History Office.. On economic conditions in Utah at the time see: Leonard J. Arrington and Thomas G. Alexander, A Dependent Commonwealth: Utah's Economy from Statehood to 1930 Charles Redd Monographs in Western History No. 4 ed. Dean L. May (Provo, UT: Brigham Young University Press, 1974).

edge of the Wasatch Mountains and the south-trending plateaus. Lake Bonneville's Provo level, on which the government constructed the Arsenal, originated sometime between 14,500 and 12,500 years ago.¹⁷ The Weber River, which carried most of the sediment to form the Provo Level in Southern Weber County and Northern Davis County imbibed deeply from the abundant rains and melting glaciers on the Uinta and Wasatch Mountains. Hefting lodes of gravel, sand, and top soil in its rapidly moving waters, the river deposited its burden in layers extending from east of the mouth of Weber Canyon to the lower reaches of the east side of the lake. At the intermediate site which the Ordnance Department Field Service team selected for the Arsenal, the river and lake had deposited a deep layer of sand. As Capt. Ora Bundy, construction supervisor for the Quartermaster Corps, put it, the "condition of the soil is such that should any accidental explosions occur within the storage magazines, the loose sand would absorb a great portion of the shock . . ."¹⁸ In sum, the porous sand, combined with the nearly 5000 foot elevation, the relatively level topography, and prevailing low humidity made the site quite satisfactory for ammunition storage.¹⁹

Predecessors of the Arsenal: Native Americans

Clearly the Ogden Arsenal did not appear in a vacuum. Numerous peoples had lived in the eastern edge of the Salt Lake Valley in northern Davis County and southern Weber County in the years before 1920. Anthropologists believe that the earliest were nomads, who collected wild plants and animals to subsist, house, and clothe themselves. By perhaps 300 B. C. groups of people living in the region had developed a culture that anthropologists call Fremont, a name given in 1931 by Noel Morss, a Harvard anthropologist, because he first discovered the remains of their culture on the Fremont River in south-central Utah.²⁰ The Fremont in Utah constituted a group of diverse cultures sharing some common artifacts such

¹⁷Lehi F. Hintze, Geologic History of Utah Brigham Young University Geology Studies, Special Publication No. 7, ed. Bart J. Kowallis (Provo, UT: Brigham Young University Department of Geology, 1988), 87-88. Halka Chronic, Roadside Geology of Utah (Missoula, MT: Mountain Press Publishing Co, 1990), 220-221.

¹⁸Bundy, "Completion Report," 6.

¹⁹"Ogden Arsenal History, June 1920-1943," part 1, 2, Arsenal Miscellaneous data, HAFB History Office.

²⁰For this discussion I have relied on David B. Madsen, "The Fremont," in Utah History Encyclopedia ed. Allen Kent Powell (Salt Lake City: University of Utah Press, 1994), 203-205; *idem.*, Exploring the Fremont (Salt Lake City: Utah Museum of Natural History, University of Utah, 1989); *idem.*, Fremont Perspectives (Salt Lake City: Utah State Historical Society, 1980); and John P. Marwitt, Median Village and Fremont Culture Regional Variation (Salt Lake City: University of Utah Press, 1973).

as grey thin walled pottery. Archaeologists have discovered the pottery as far west as central Nevada, as far north as the Portneuf river basin in southeastern Idaho, east to Grand Junction on the Colorado, southeast to Moab, Utah and southwest to St George, Utah. In addition, as early as 300 B. C. the Fremont peoples had begun to grow and harvest a particular type of fourteen row dented corn.

For the most part, however, those Fremont peoples who lived near the site of Ogden Arsenal appear to have continued to subsist themselves by hunting and gathering until perhaps 700 A. D. By about that time, the northern Utah group--along with most Fremont peoples--had adopted a relatively sedentary life style, relying more on agriculture than on hunting and gathering. Living in semi-subterranean pit houses, they also constructed above ground mud or rock walled granaries. A major problem that archaeologists have in identifying and distinguishing Fremont peoples from their contemporaries is that other Native Americans throughout the United States began to live more relatively sedentary lives at the same time, to take up farming, and to construct pit houses not unlike those of the Fremont. Nevertheless, Fremont peoples produced a peculiar type of one-rod-and-bundle basketry, fourteen row dented corn, moccasins made from the hock of a deer or mountain sheep, clay figurines, and the gray coil pottery through which archaeologists generally identify them.

By about 1250 A. D. the Fremont peoples began to disappear from the region. Archaeologists judge the disappearance of their culture from the absence of their basketry, pottery, and clay figurines in the sites they have excavated throughout the region they previously occupied. Although anthropologists are not sure, most believe that the Numic or Shoshonean speaking peoples replaced, removed, or assimilated the Fremont.

The Numics who lived in Weber and Davis County at the time of Euro-American contact belonged to the larger group of Northwestern Shoshoni.²¹ Misnamed the "Weber Ute," and often called the Cumumba, these peoples lived at first in a hunting gathering life style. They succeeded where the Fremont had failed, in part because they adopted a new technology for gathering the seeds of grass by using a flat seed beater and a wide flat basket for harvesting. In addition, they relied more on hunting and gathering and less on agriculture than the Fremont. This strategy proved more successful in Utah during the dry years of the thirteenth and succeeding centuries.

Still, their life style changed as well, particularly as a result of the introduction of the horse sometime during the late 18th century. Following the Pueblo Revolt against the Spanish in 1680, New Mexican Indians captured and traded horses previously domesticated and introduced to the region by the Spanish. The Shoshoni eventually acquired horses descended from those captured from the Spanish. By 1840 as the fur trade declined in

²¹For the discussion of the Numic peoples of this region, I have relied most heavily on Brigham D. Madsen, "The Shoshoni Indians (Northwestern Bands)" in Utah History Encyclopedia ed. Allan Kent Powell (Salt Lake City: University of Utah Press, 1994), 497-498; idem. The Northern Shoshoni (Caldwell, ID: Caxton, 1980); and idem. Chief Pocatello, the "White Plume" (Salt Lake City: University of Utah Press, 1986).

importance, they had adopted the culture of Plains Indians like the Sioux and Cheyenne, using the horse to move from place to place while hunting game.

Precursors of the Arsenal, The Mountain Men, Explorers, and Overland Migrants

As the Numics occupied the Arsenal region, beginning in the 1820s Mountain Men and Fur traders began to penetrate into the Central Rockies and the Salt Lake Valley.²² Most of these new emigrants, Euro-Americans and African Americans rather than Native Americans, came from three sources. From Taos, New Mexico--Mexican territory after 1821--came trappers and traders like Antoine Robidoux, Etienne Provost, and Christopher "Kit" Carson. From St. Louis, American trappers like Jedediah Smith, James Bridger, William H. Ashley, and Joseph R. Walker moved in. From Fort Vancouver and Fort Nez Perce in present day Washington and Flathead Post near Eddy, Montana--territory jointly occupied by Great Britain and the United States--Peter Skene Ogden brought British trappers recruited in Canada and other British possessions.

These adventurers and businessmen engaged in the trapping business, explored the region, met at rendezvous, established forts, and served as guides for later explorers. Some like Jedediah Smith, Peter Skene Ogden, Joseph R. Walker, Warren Ferris, and Osborne Russell left maps and diaries that described the region for others who came after. Others established forts like Fort Laramie and Fort Bridger on Oregon-California trail. Miles Goodyear, who had worked as a trapper built a fort on the Weber River near its confluence with the Ogden probably in 1845 or early 1846. This was the earliest permanent Euro-American settlement near the Arsenal property.

Hard on the heels of these Mountain Men, and using their expertise as guides, came government sponsored explorers. Most important for the Arsenal property was an expedition of 1843-44, led by John C. Frémont of the U.S. Corps of Topographical Engineers. Guided by former Mountain Man Kit Carson, the party entered and described the Salt Lake Valley.²³ A voyage in a leaky inflatable raft to Fremont Island on Great Salt Lake took the

²²For this discussion of the Fur Trade, I have relied on Scott J. Eldredge and Fred R. Gowans, "The Fur Trade in Utah," in Utah History Encyclopedia ed. Allan Kent Powell (Salt Lake City: University of Utah Press, 1994), 208-213; Gloria Griffen Cline, Exploring the Great Basin (Norman: University of Oklahoma Press, 1963); Dale L. Morgan, Jedediah Smith and the Opening of the West (Lincoln: University of Nebraska Press, 1953); *idem.*, The West of William H. Ashley . . . (Denver: Old West Publishing Co., 1964); David J. Weber, The Taos Trappers: The Fur Trade in the Far Southwest, 1540-1846 (Norman: University of Oklahoma Press, 1971); Gloria Griffen Cline, Peter Skene Ogden and the Hudson's Bay Company (Norman: University of Oklahoma Press, 1974).

²³Mary Lee Spence, "John Charles Frémont," in Utah History Encyclopedia, ed. Allan Kent Powell (Salt Lake City: University of Utah Press, 1994), 205-06; Allan Nevins,

party west of the Arsenal site, and explorations on land north of the site provided information on the land, plants, and animals nearby. In his most important legacy, Frémont described and advertised the country for settlers who came later.

As early as 1841 overland migrants began moving through Utah. In 1846, three parties, following a cutoff on the California trail from Fort Bridger touted by Lansford W. Hastings descended Weber Canyon and headed south along the Great Salt Lake, passing near the Arsenal site. A much better known party led by Jacob Donner and James Reed left from Fort Bridger somewhat later than the other three. Entering the Salt Lake Valley by way of Emigration Canyon more than thirty miles south of the Arsenal, they crossed the site of Salt Lake City. After traversing the Great Salt Lake Desert and central Nevada, they became trapped by an early snow near Donner Lake on the eastern slope of the Sierra Nevada. Forty-seven of a party of eighty-seven survived, some through cannibalism.

Precursors of the Arsenal: Mormon Pioneers and the Settlement of the Region

With the exception of the Native Americans and possibly Miles Goodyear these people had viewed the Salt Lake Valley as a place to exploit, explore, or get through. Though they provided valuable information for those who came after, they had little intention of remaining themselves.

In 1847, however, a band of Mormon pioneers, refugees from a civil war in Illinois, followed the route of the Donner Party into Salt Lake Valley. This party constituted the advance regiment of an army of settlers who built Utah's population to nearly 450,000 by 1920.

From the first settlement at Salt Lake City in late July 1847, Mormon pioneers began to move north along the Wasatch Front into Davis and Weber Counties. During the winter of 1847-48, Peregrine Sessions and Hector C. Haight moved their stock into Davis County for forage, and by 1850 settlers had established towns at Farmington, Kaysville, and Layton just south of the Arsenal site.²⁴ James Brown, who arrived in Utah in 1847 from service in the Mexican War, purchased Miles Goodyear's Fort Buenaventura, renamed it Brownsville,

Fremont: Pathmaker of the West (New York: D. Appleton-Century, 1939); and Donald C. Jackson and Mary Lee Spence, The Expeditions of John Charles Fremont 3 vols. (Urbana: University of Illinois Press, 1970ff).

²⁴Eugene E. Campbell, Establishing Zion: The Mormon Church in the American West, 1847-1869 (Salt Lake City: Signature Books, 1988), 59. On Davis County see Stanford J. Layton, "Davis County," in Utah History Encyclopedia ed. Allen Kent Powell (Salt Lake City: University of Utah Press, 1994), 127-28.

and began to expand the settlement. Settlers began to move to the site. By 1850, renamed Ogden after Peter Skene Ogden, the town had a population of more than 1,100 people.²³

Construction of Railroads and Development of Transportation in the Arsenal Region

Ogden remained the third largest city in Utah Territory after Salt Lake City and Provo until the completion of the transcontinental railroad in 1869. The joining of the Union and Central Pacific Railroads at Promontory Summit in 1869 benefited Ogden and Northern Utah.²⁶ Leaders of the Church of Jesus Christ of Latter-day Saints negotiated an agreement with the Central (later Southern) Pacific owners to construct their terminal facilities in Utah at Ogden. This made Ogden the junction point of the two railroads. In 1870, the Mormon leadership linked Ogden to the future Arsenal site by constructing the Utah Central Railroad to Salt Lake City.

In 1872, the owners of the Union Pacific Railroad purchased the Utah Central Railroad from the LDS Church leaders. In 1880, the UP laid tracks as far as Frisco, a mining town in Beaver County. The railhead remained there until 1905 when the Union Pacific led by Montana financier William A. Clark and a group from St. Louis extended the tracks to Los Angeles.

The Denver and Rio Grande Western added a second route into the Arsenal region from the east by extending its lines into Ogden in 1883. Mining Entrepreneur Simon Bamberger completed the Bamberger Railroad as an interurban steam railroad between Utah's two largest cities in 1905. The company electrified the line between the two cities in 1910.

The "Good Roads" movement of the early twentieth century had its impact on the Arsenal site as well. During the period immediately after 1900, the American automobile industry sponsored the designation and construction of the Lincoln Highway which crossed Utah south of Salt Lake City. After the development of standard highway designation, most of it became U. S. Highway 40. U. S. Highways 30 and 40 stretched east and west linking the Pacific Coast with the Midwest through Utah. U. S. Highways 89 and 91 linked Utah with Arizona and the Los Angeles region to the south and western Idaho to the north. Connecting highways stretched on to Portland and Seattle. The construction of these and other federal and state highways provided secondary ties with the Arsenal area through which

²³Campbell, Establishing Zion, 59-60. On the development of Ogden and Weber County see Murray M. Moler, "Weber County," in Utah History Encyclopedia ed. Allan Kent Powell (Salt Lake City: University of Utah Press, 1994), 624.

²⁶On the construction and operation of railroads see Don Strack, "Railroads in Utah," in Utah History Encyclopedia ed. Allan Kent Powell (Salt Lake City: University of Utah Press, 1994), 450-455; and Leonard J. Arrington, Great Basin Kingdom: An Economic History of the Latter-day Saints, 1850-1900 (Cambridge: Harvard University Press, 1958), Chapter 9.

trucks and autos could back up the primary reliance on rail transportation for the shipment of munitions.

Acquisition of the Site and Construction of the Arsenal

As the Quartermaster Department anticipated construction at the Arsenal, Senator Reed Smoot asked his friend Edward E. Jenkins to assist in appraising the land.²⁷ The federal government spent \$89,053.30 on the first tract of 1,222 acres.²⁸ The government purchased the site from twenty-four owners. Most were small farmers with average holdings of just over fifty acres, though the largest owner, N. O. Ogden, owned 200 acres and the smallest, Ellen E. Woolsey, just 10.²⁹

The government tried to supply water by drilling on the reservation. After drillers ended up with a 400 foot dry hole, and after deeper drilling proved prohibitively expensive, the War Department acquired Harbertson Springs near the mouth of Weber Canyon from the State of Utah, Parley Harbertson, and the Ogden Chamber of Commerce. To protect its water supply from pollution by grazing cattle and sheep, the government purchased an additional 210 acres of land surrounding the spring in November 1920. Anxious to promote the construction of the Arsenal, the Ogden Chamber of Commerce cooperated closely with the Quartermaster Corps in the property acquisition, apparently purchasing some of the property at Harbertson Spring and donating it to the government.³⁰

After first assigning Capt. William P. Katz during May and June 1920, the Army's Third District Construction Service at Fort Mason, California assigned Capt. Ora Bundy, later Ogden's mayor (1930-34), to supervise the construction of the Arsenal's buildings. Bundy reported for duty on July 13, 1920, and he remained at the Arsenal until December 31, 1921, shortly after completion of the construction.

²⁷Reed Smoot, Diary, March 13, 1920, MS, Manuscripts Department, Harold B. Lee Library, Brigham Young University, Provo, UT.

²⁸"Ogden Arsenal History, June 1920-1943," 3, Arsenal Miscellaneous data, HAFB History Office.

²⁹"Ogden Arsenal History, June 1920-1943," Section entitled, "Real Estate." Arsenal Miscellaneous data, HAFB History Office.

³⁰Thomas G. Alexander, "Ogden's 'Arsenal of Democracy' 1920-1955," Utah Historical Quarterly 33 (Summer 1965): 238; "Ogden Arsenal History, June 1920-1943," 4-5, and Section entitled "Real Estate." Arsenal Miscellaneous data, HAFB History Office. Arsenal Records indicate the value of property acquired from the Ogden Chamber of Commerce at \$21,000. Since the total cost of the property acquired does not include that amount, it seems probable that the Chamber donated the property to the War Department for the Arsenal.

After competitive bidding, the W. M. Sutherland Company of St. Louis, Missouri won the general contract. Sutherland and its subcontractors built a number of buff colored brick buildings which served to house the principal administrative and service facilities. These brick buildings included a 17,421 sq. ft. administration building; a 25,411 sq. ft. fire and guard house; a 37,776 sq. ft. general warehouse (constructed with some tile); a 55,776 sq. ft. combination heating plant, machine shop, and locomotive house; and a 19,648 sq. ft. stable. Other buildings included a concrete and stucco garage; a wood observation tower; hollow tile repacking houses, field office, range guard house; and a range guard stable. In addition, even though the installation had a full sewer system, the specifications demanded and the contractor constructed eleven "portable sanitary latrines,"--four hole privies.³¹

A number of these buildings remain standing today. One of them, building B 1118, served until 1943 as a combination Arsenal headquarters and bachelor officers quarters (BOQ). Constructed on what Arsenal personnel later called the General's Loop, it was later renamed Hobson House in honor of Gen. Kenneth B. Hobson, a commander of the Ogden Air Logistics Center.³² Two other buildings remaining from this first construction include B 1133, constructed to repair, maintain, and modify motor vehicles. Originally framed in wood, its frame was replaced by a steel truss in order to support an overhead crane used to hoist engines. The Sutherland company built another, B 1132 as a locomotive repair facility. The building originally contained two locomotive repair bays, accessible from the north through steel rolling doors. Both bays housed overhead cranes capable of supporting ten tons. The Ordnance Department equipped one of the locomotive repair bays with a pit of the type common to some automobile service facilities, which allow access to the underside of the vehicles. During World War II, the building was converted into a machine and welding shop to support B 1701, a newer locomotive repair facility with eight locomotive bays.³³

The heart of the 1921 facility consisted of 35 standard ammunition magazines with walls of hollow tile and graveled paper roofs supported by steel trussed pilasters. The magazines also had concrete floors and foundations and metal fire doors. Ordnance Department technicians believed that the deep sand and the hollow tile walls would absorb the

³¹"Ogden Arsenal History, June 1920-1943," Part One, 6-7; "Section Two, Hill Air Force Base Survey Report," 15 Arsenal Miscellaneous data, HAFB History Office.; Alexander, "Ogden's 'Arsenal of Democracy,'" 238-39.

³²Mary Troutman, "Historic American Engineering Record, Ogden Arsenal, Bachelor Officers' Quarters/Office Building . . ." HAER No. UT-84-D.

³³Mary Troutman, "Historic American Engineering Record, Ogden Arsenal, Motor Repair Shop," HAER No. UT-84-I; *Idem.*, "Historic American Engineering Record, Ogden Arsenal, Locomotive Shop and Shelter," HAER No. UT-84-H; *Idem.*, "Historic American Engineering Record, Ogden Arsenal, Locomotive Repair Shop," HAER No. UT-84-AO.

initial shock of an accidental blast, then the walls would explode outward dissipating the energy and protecting the surrounding buildings and people from injury.³⁴

In a very real sense, the government equipped the Arsenal like a small town. The War Department spent \$75,732 for a central heating plant and distribution system and an internal power grid. The facility accessed its electricity from an 11,000 volt line connected with Utah Power and Light Company on State Highway 126 in Sunset. The Signal Corps installed an automatic telephone system which it connected to the Ogden City exchange of Inter-Mountain Telephone Company. Railroads furnished the principal transportation for the facility. To provide internal munitions transportation and to connect the Arsenal with the Bamberger Railroad, the contractor built nearly ten miles of standard gauge track on the reservation. Contractors poured concrete for all of the roads and sidewalks. The Arsenal had its own machine shop and carpenter shop. As of December 1, 1923, the total value of the capital invested in the Arsenal was \$1,772,310.³⁵

On January 7, 1921, Maj. Oliver H. Presbrey of the Ordnance Department reported for duty as commanding officer. Between February 19 and October 15, 1921, as the contractor completed each of the units, Bundy turned responsibility for them over to Presbrey. Bundy remained on duty as the constructing quartermaster until December 31, 1921.³⁶

The official designation of the facility tells much about its purpose. Originally designated as "Ogden Arsenal, Ogden, Utah," the Ordnance Department changed the facility's designation to "Ogden Ordnance Reserve Depot, Ogden, Utah," on November 15, 1921. As a reserve depot, the Arsenal received bulk stocks from factories and held them for emergency use. From 1921 until 1925, the installation employed between 5 and 20 people, generally to receive, log in, and store munitions.³⁷

The Arsenal becomes a Dormant Facility

Increasingly during the 1920s, as Americans became disenchanted with military involvement abroad, installations like the Ogden Ordnance Reserve Depot seemed like undue

³⁴"Ogden Arsenal History, June 1920-1943," Part One, 7. Arsenal Miscellaneous data, HAFB History Office. Note: some of the documents indicate that the roofs were ruberoid. The historical summary on the building construction lists them as "graveled paper."

³⁵"Ogden Arsenal History, June 1920-1943," Part One, 7-8. Arsenal Miscellaneous data, HAFB History Office.

³⁶Alexander, "Ogden's 'Arsenal of Democracy,'" 238-39.

³⁷"Ogden Arsenal History June 1920-1943," Part One, 9; "Section Two, Hill Air Force Base Survey Report," 16-17, Arsenal Miscellaneous data, HAFB History Office.; Alexander, "Ogden's 'Arsenal of Democracy,'" 239.

burdens on the American economy. The United States Senate rejected the Versailles Treaty which Wilson and the Allied leaders negotiated to reconstruct the post-war world and to establish the League of Nations. Spurning any international involvement that might compromise American sovereignty or commit the nation to a foreign war, Congress reduced military appropriations until in 1924 the War Department's budget stood at \$5 million, half the amount appropriated in the pre-World War 1 year of 1910.³⁸ Between 1923 and 1936, every Ordnance installation felt the pinch of America's penchant for economy.³⁹

In 1920, the Ordnance Department had twenty-two storage depots. By 1923, that number had shrunk to 16--7 ammunition (for the receipt, storage, and shipment of munitions), 2 reserve (for the storage of bulk stocks for emergency use), and 7 general supply depots (for the receipt, storage, and shipment of a wide range of materiel). Of the depots only Benecia, CA; San Antonio, TX; Ft. Wingate, NM; and Ogden were located west of the Mississippi.⁴⁰ As a reserve depot, Ogden was assigned the storage of reserve war materiel.

This deemphasis on the military showed up rapidly in the Depot's command structure. The Ordnance Department relieved Maj. Presbrey from duty on May 19, 1923, and he left the station on June 11. In his place, Warrant Officer John McDonald, who had served on the post since October 20, 1922 assumed command. Mr. McDonald remained in command until March 12, 1926 when, in a further reduction of the Depot's status, Tech. Sgt. (later M. Sgt.) Joseph Zaine, who had served at the Depot since February 1925, assumed command. From 1926 through 1935 Zaine commanded the post, generally with the assistance of one other tech. sgt.⁴¹

The facility deteriorated as a result of neglect both of improvement and of rudimentary repair. The Ordnance Department classified the munitions stored at the Depot as excess and obsolete. The army leased portions of the lower area for grazing. Before Bundy left, he recommended a number of improvements. The installation had established its only rail connection with the nearby Bamberger Railroad. This seemed sufficient at the time, but it meant that in any long distance shipment, the army would have to transfer munitions to one of the larger railroads either at Ogden or at Salt Lake City. Bundy recommended additional connections with the other nearby interstate railroads. He also recognized that local environmental conditions posed potential hazards for the base. He predicted that the

³⁸Green, Thomson, and Roots, Planning Munitions for War, 40.

³⁹Green, Thomson, and Root, Planning Munitions for War, 43.

⁴⁰Green, Thomson, and Root, Planning Munitions for War, 38.

⁴¹"Ogden Arsenal History, June 1920-1943", Part One, 9-10, Arsenal Miscellaneous data, HAFB History Office.; Alexander, "Ogden's 'Arsenal,'" 238-39.

alternating heat and cold coupled with "winds from Weber Canyon," would weaken the storage magazines and destroy their roofs.⁴²

As a result of meager appropriations, the Ordnance Department chose to ignore these recommendations. On June 16, 1929 all but five of the storage magazines (B 1374, B 1375, B 1376, B 1474, and B 1476) blew down when cross-winds created a tornado effect at the base.⁴³ Later, perhaps when the Ordnance Department repaired the remaining magazines, workers replaced the roofs of these buildings with cement asbestos shingles and the original loading doors with larger sliders.⁴⁴

In the meantime, mirroring the ambivalent attitudes of the American public toward the military, citizens from the farms, towns, and cities near the Depot debated the future of the facility. In general, those associated with cities, commerce, and industry favored the retention and upgrading of the Depot while those associated with rural areas, smaller towns, and agriculture favored its abandonment. Supporters included Julian M. Bamberger, who had replaced his deceased father as president and general manager of the railroad; Archie P. Bigelow, president of the Ogden State Bank; and Ezra J. Fjeldsted, executive secretary of the Ogden Chamber of Commerce. All of these favored upgrading of the facility, additional construction, and the shipment of additional munitions to the Depot. On the other side, citizens of Layton circulated a petition asking that the Ordnance Department stop shipping in munitions. E. P. Ellison, president of the Davis & Weber Counties Canal Company, said that he feared an explosion might damage the company's canal.⁴⁵

Political leaders weighed in on the controversy. Representative Elmer O. Leatherwood of Salt Lake City, whose district included Davis County, failed to see any benefit to the community; and he opposed the expansion of the Depot. Representative Don Colton, of Vernal, whose district included Ogden was somewhat more supportive. Probably because they represented both the rural and urban areas, both Senators Smoot and King

⁴²"History Ogden Arsenal, June 1920-1943," Part One, "Recommendations Covering Improvements on Future Installations at This Project," 1-3, Arsenal Miscellaneous data, HAFB History Office.

⁴³"Ogden Arsenal History, June 1920-1943," Dormant Period, 1923-1935, 12; "Section Two Hill Air Force Base Survey Report," 17, Arsenal Miscellaneous data, HAFB History Office.

⁴⁴Mary Troutman, "Historic American Engineering Record, Ogden Arsenal, Standard Ammunition Magazine," HAER No. UT-84-AB.

⁴⁵Section Two, Hill Air Force Base Survey Report, 16-17, Arsenal Miscellaneous data, HAFB History Office.

declined to take a position on the facility's expansion, even though both had supported the initial construction.⁴⁶

Though the War Department generally cleaned up damage caused by the wind of June 1929, it did little to rehabilitate the Depot. After an inspection of the damage, the War Department decided only to clear the debris from the destroyed buildings, repair the damage to the reparable buildings, and retain the Depot in inactive status. Flooding and a minor earthquake also plagued the facility, but the Ordnance Department did little except clean up the most serious damage.⁴⁷

Revival and Reconstruction of the Depot as an Arsenal

From 1923 through 1935, the Depot deteriorated--neglected by the military, unwanted by many of its neighbors, and ravaged by the elements. By 1935, however, conditions in the United States and the world had changed dramatically from the 1920s.⁴⁸ During the mid-1920s, President Calvin Coolidge could announce with confidence that "the business of America is business." During the late summer and fall of 1929 Americans learned that businesses were every bit as vulnerable as the Depot. The stock market crash of October 1929 paced the economy into a slump the like of which Americans had never seen before or since. President Herbert Hoover accelerated public works projects to try to help people find jobs, and Utah's government, headed by Governor George H. Dern, did the same to the extent of its meager resources.

By the winter of 1932-33 the American and world economies had reached rock bottom. Unemployment in the United States reached an astounding 25 percent of the labor force, and joblessness in Germany reached 50 percent. In Utah unemployment reached an abysmal 36 percent. The election of 1932 laid low the Republicans and brought Franklin D. Roosevelt to the White House with the caution that the "only thing we have to fear is fear, itself." For Secretary of War, Roosevelt picked Governor Dern, who had declined to run for a third term in 1932. In Utah, the voters retired long-time Republican stalwart, Reed Smoot, electing liberal Democrat, Elbert D. Thomas in his place. The electorate also voted in a solidly Democratic legislature.

Since Dern and his successor as Utah's Governor, Henry H. Blood, both believed that policies of the federal government had caused the depression, they had few qualms about turning to Washington for assistance. Blood spent a great portion of his first months in

⁴⁶Section Two, Hill Air Force Base Survey Report, 16-17, Arsenal Miscellaneous data, HAFB History Office.

⁴⁷"Ogden Arsenal History June 1920-1943," Dormant Period, 13-14, Arsenal Miscellaneous data, HAFB History Office.

⁴⁸The following discussion is based on Thomas G. Alexander, Utah. The Right Place: The Official Centennial History (Layton, UT: Gibbs Smith, 1995), Chapter 12.

Washington pleading for New Deal construction projects for Utah and Secretary of War Dern accompanied him on many of his visits to President Roosevelt and to executive officers like Harold Ickes of the Public Works Administration (PWA) and Harry Hopkins, head of the Federal Emergency Relief Administration (FERA) and after its creation in 1935, the Works Progress Administration (WPA). In part because of his persistence, in part because of the cooperation of the Utah legislature in providing matching funds, and in part because of the help of Secretary Dern, Blood managed to pry loose from the federal government an amount Ickes estimated at 270 percent of Utah's per capita share of PWA funds.

As the depression deepened, the world became an increasingly violent place. Between 1927 and 1938, the Japanese launched a campaign of conquest to create an empire rivaling that of the British, French, and Dutch, which they called the Greater East Asian Co-Prosperity Sphere. In the process they occupied Manchuria, Beijing, Tientsen, and other northern Chinese cities; and they began their invasion of south China.

In 1933, Adolph Hitler assumed power in depression-ravaged Germany, anxious to reestablish German military power and to exact revenge for his country's humiliation in the Versailles Treaty. After rebuilding the army, Germany reannexed the Saar industrial area, reoccupied the Rheinland, and annexed Austria and the Sudeten region of Czechoslovakia in 1935, 1936, and 1938.

Italy launched a bid for its own empire in Africa. In 1935, Italy invaded Ethiopia, and it annexed the country in 1936.

In response to European and Asian imperialism, Congress tried to insulate the United States from foreign entanglements while preparing to defend itself from potential enemies abroad. To try insure that American troops would not have to fight on foreign ground, in May 1935, Congress passed the first of a series of neutrality acts which embargoed the shipment of arms to belligerents and declared that American citizens who traveled on ships of nations at war did so at their own risk.

To prepare for a possible defense of the American homeland, in February 1935, the War Department adopted a series of mobilization regulations. These regulations provided for the increased production of munitions and for the expansion of the Air Corps. Both these measures anticipated the need for additional artillery shell and bomb storage and for the renovation and construction of additional weapons and munitions.⁴⁹

To implement the regulations, before his death in late August 1936, Secretary of War Dern ordered the Chief of Ordnance, Maj. Gen. William H. Tschappat to submit a plan for the operation of his installations. Tschappat assigned a board of five officers headed by Col. Norman F. Ramsey to set priorities for the expansion of ordnance facilities. Dern outlined conditions for the Ramsey Board which virtually guaranteed that previously favored installations on the east and west coast would suffer. Dern said that under the mobilization

⁴⁹Harry C. Thomson and Lida Mayo, United States Army in World War II, The Technical Services. The Ordnance Department: Procurement and Supply (Washington, D. C.: Office of Military History, Department of the Army, 1960), 361-62.

regulations, the Ordnance Department should anticipate no new depots for wartime reserves east of the Appalachian Mountains or west of the Cascade-Sierra Ranges. In addition, the Ramsey board recommended that the Ordnance Department locate all depots at a safe distance from the northern and southern boundaries of the United States. Moreover, members of the Ramsey board argued that the best location in time of peace were those best suited for wartime.⁵⁰

To meet those requirements, the Ramsey board recommended a system of regional depots. To serve the Mountain, Pacific Coast, and Hawaii, they recommended the enlargement of the arsenals at Ogden and Benicia. For the central United States, they recommended posts at Rock Island and Savanna, Illinois. For the southeast, they recommended Augusta Arsenal, Georgia. For the southwest, they thought the Ordnance Department could rebuild San Antonio Arsenal. For the northeast, they would have preferred a new depot in Pennsylvania, but believed that additional construction at Raritan, New Jersey would serve. They also proposed the eventually closing through attrition arsenals on the east coast at Curtis Bay, Maryland; Nansemond, Virginia; and Charleston, South Carolina.⁵¹

By the time the Ramsey Board made its recommendations, Secretary Dern had died, and his death may have influenced the failure to shift a greater portion of the storage facilities to the west. Moreover, although Brig. Gen. E. M. Shinkle, Chief of the Field Service, supported the recommendation for new construction at Ogden as well, Gen. Tschappat rejected part of the recommendations by proposing to retain the east coast depots. Apparently as a result of this failure to provide additional facilities in the west, at the outbreak of the war in Europe in 1939, 65 percent of the Ordnance storage space remained on the east coast, about 27 percent in the central U. S., and only 7 percent in the west. In spite of a reinvigorated buildup that began in 1940, this decision left the United States poorly prepared for the Pacific war thrust upon it in 1941.⁵²

Nevertheless, in 1935, lobbying by Dern and Blood paid off for Utah. Since the War Department had no funds for new construction, officials approached Harry L. Hopkins for WPA assistance in building and renovation at the Depot, to be redesignated as an arsenal. Hopkins approved the request, and in the construction that began in 1935 the WPA spent nearly \$920,000.⁵³ Construction proceeded under the direction of Maj. Edward M. George,

⁵⁰Thomson and Mayo, Ordnance: Procurement and Supply, 361-62.

⁵¹Thomson and Mayo, Ordnance: Procurement and Supply, 361-62.

⁵²Alexander, "'Ogden's Arsenal of Democracy,'" 240; Thomson and Mayo, Procurement and Supply, 362-63.

⁵³The discussion of the construction during the 1930s is based on "Ogden Arsenal History June 1920-1943," C- Reconstruction Period (1936-1939), no pagination, Arsenal Miscellaneous data, HAFB History Office.

constructing quartermaster, who played a role similar to that of Bundy in the original construction.⁵⁴

Similar construction continued through 1942. In total, the government spent an estimated \$3.5 million between 1935 and 1938 and \$6.1 million between 1940 and 1942 for new construction and rehabilitation at the Ogden Arsenal.⁵⁵

The enhanced status of the Arsenal appeared in the command structure between 1935 and 1938. At the inauguration of the acceleration of buildup in 1935, Capt. Carroll H. Deitrick assumed command from Sgt. Zaine. June 15, 1938, Maj. Ittai A. Luke took over from Capt. Deitrick.⁵⁶

Anxious to facilitate this boon to their shattered economy, in several cases, the Ogden Chamber of Commerce stepped in to assist by purchasing land for the Arsenal's expansion. In the summer of 1936, for instance, the War Department found itself short of funds to purchase new property. Largely through the efforts of Frank M. Browning, chair of the Ogden Chamber of Commerce's military affairs committee, the chamber "purchased a quarter section of land adjoining the reservation to the north and presented it to the United States."⁵⁷

All told, these projects involved the rehabilitation of existing buildings, the construction of new buildings, and the installation of facilities such as railroads, sewers, power distribution systems, water systems, and roads. For storage, the WPA constructed igloo type storage magazines. The igloo storage magazines (at first B 1458-1499) provided space for the storage of munitions until some emergency called for their use. B 1484, for instance, is a 29 x 41 igloo storage magazine constructed in 1938. The igloo consists of reinforced concrete structure with a double-door entry set in a truncated trapezoidal wall. An earth mound covering three of the exterior walls provides additional protection against blast damage.⁵⁸ Raw explosive chemicals such as tetryl, phosphorus, and amatol components came to the Arsenal by rail. Packed in rubber cups, these chemicals were placed in wooden boxes and loaded into wooden crates. Arsenal personnel stored these in bombproof shelters

⁵⁴Ogden Standard Examiner, December 17, 1937, "Ogden Arsenal, Press Articles, 1936-1938," Arsenal Miscellaneous data, HAFB History Office.

⁵⁵Alexander, "Arsenal of Democracy," 242.

⁵⁶Salt Lake Tribune, June 7, 1938, "Ogden Arsenal, Press Articles, 1936-1938," in Arsenal Miscellaneous data, HAFB History Office.

⁵⁷Carroll H. Deitrick, "Information Circular," June 5, 1937, Folder: Ogden Arsenal--Transmittal of Administration Building Plans, Bldg 1192;" On File at Historian's Office, Ogden Air Logistics Center; Ogden Standard-Examiner, September 17, 1938, in "Ogden Arsenal Press Articles, 1936-1938," Arsenal Miscellaneous data, HAFB History Office.

⁵⁸Mary Troutman, "Historic American Engineering Record, Ogden Arsenal, Igloo Type Magazine," HAER No. UT-84-AC.

like B 2132, constructed in 1942. A double-sided, center passage igloo located in the West Loading Plant area, B 2132 has walls, floor, and roof of reinforced concrete with the roof and side walls shielded by earthen mounds.⁵⁹

The Arsenal also acquired new shop machinery and three locomotives. In anticipation of its expanded role, the WPA crews remodeled the former fire and guard house into an administration building much larger than the original. They also remodeled a stone farm house into a residence for the commanding officer (B 789-790) and some old stables into apartments for non-commissioned officers (B 785-786).⁶⁰ Between 1925 and 1938 employment at the Arsenal on WPA projects averaged 100 to 500. In order to complete construction of the bomb loading plant in June 1938, Congress approved funding for more than 1,150 WPA and Public Works Administration (PWA) employees at the depot.⁶¹

An architectural description of some of these buildings provides some insight into the type of construction, the condition of the installation, and the activities carried on. The Ordnance Department, for instance, commissioned for senior officers' quarters building B 1110, a red brick two-and-one-half story Colonial Revival and Georgian house located on the General's Loop. Given the army's hierarchical system, nearby non-commissioned officers' family housing (B 1120), though constructed in a similar Colonial Revival-Georgian style, provided less space per person. Thus, this red-brick duplex is of a much less imposing structure.⁶²

Other buildings served different purposes in the receipt, storage, and manufacturing facilities. B 1148, the railroad scale house, allowed employees to monitor and weigh train cars on up to five separate tracks from a single concrete block structure.⁶³ Built for permanence, B 1227 is a rectangular brick ammunition component warehouse of about 67 x

⁵⁹Mary Troutman, "Historic American Engineering Record, Ogden Arsenal, Bombproof Shelter (Barricade)" HAER No. UT-84-BG.

⁶⁰Unfortunately, the information from the newspapers on these buildings is so sketchy it is difficult to determine which buildings these may have been.

⁶¹Estimates compiled from Salt Lake Tribune, June 5, 24, July 6, 1938 and Ogden Standard Examiner, June 25, July 12, 1938.

⁶²Mary Troutman, "Historic American Engineering Record, Ogden Arsenal, Officer's Family Housing," HAER No. UT-84-B; see HAER No. UT-84-E for the description of some of the non-commissioned officer's family housing.

⁶³Mary Troutman, "Historic American Engineering Record, Ogden Arsenal, Railroad Scale House & Scales," HAER No. UT-84-J.

200 feet. Similar warehouses were subdivided into offices; others were left for open storage.⁶⁴

Part of buildings constructed as WPA projects facilitated major changes in the Arsenal's mission. Previously the Ordnance Department had used the Depot exclusively for storage of munitions. As the Depot moved into its dormant period in the mid-20s it housed obsolete munitions.

Significantly, the new mission included the shift of function from a depot to an arsenal. The WPA constructed 12 especially-designed manufacturing buildings. In these Arsenal employees loaded shells for the artillery and bombs for the Air Corps. The Ogden Chamber of Commerce, which had provided assistance for the Arsenal previously, considered this project so significant that when it appeared that the Arsenal would have to delay opening the loading plant, the Ogden Chamber of Commerce purchased additional land which allowed the Department to open its ammunition loading plant a year earlier than it might otherwise have done.⁶⁵

Manufacturing facilities from the 1938 construction include B 1420 and B 1424. B 1420 is an 80 x 50 gable-roofed building with a loading platform and fire wall. It housed part of the facilities for the manufacture of 100 pound Amatol bombs. In this building, employees painted and labeled bomb casings, then they passed them on to other buildings for further processing.⁶⁶

As part of the new construction, the Arsenal attempted to solve environmental problems that posed a threat to the integrity of the storage and manufacturing functions. The blasts of winds that regularly whipped down Weber Canyon drifted the loose sand which offered such an excellent buffer against accidental explosion. In cooperation with the Agriculture Department, the WPA experimented with plantings of native desert grasses to try to control the drifting sand. These proved unsatisfactory, since, though wild thistle and sunflower provided stabilized the sand when green, they became a fire hazard when they dried out. In April 1937, to assist in taming the powerful winds, Civilian Conservation Corps enrollees planted five shelter belts consisting of 7,500 ponderosa pine, Russian olive,

⁶⁴Mary Troutman, "Historic American Engineering Record, Ogden Arsenal Warehouse," HAER No. UT-84-K.

⁶⁵Deitrick, "Information Circular," June 5, 1937; U. S. Air Force, Materiel Command, Air Logistics Center, "Cultural Resource Management Plan for Hill Air Force Base, Utah," II-35.

⁶⁶Mary Troutman, "Historic American Engineering Record, Ogden Arsenal, Warehouse," HAER No. UT-84-Z.

Siberian elm, and honey locust supplied by Utah State Agricultural College. The CCC also planted grass to assist in stabilizing the sand.⁶⁷

In October 1938, the Arsenal began manufacturing aerial bombs and howitzer shells. The first missions included 2,000 lb., M 34 demolition bombs; 1,100 lb. M 33 demolition bombs; 600 lb. M 32 demolition bombs; and Mk. 1 high explosives for the 155 Howitzer.⁶⁸

A report assessing the importance of the 1938 expansion indicated that the Ogden Arsenal ranked among the most important of those facilities not assigned the manufacture of guns, rifles, and machine guns. In size, the Ogden Arsenal ranked with those at Erie, Ohio; Nansemond, Virginia; Charleston, South Carolina; Benecia, California; Augusta, Georgia; Curtis Bay, Maryland; Frederickstown and Raritan, New Jersey; San Antonio, Texas; and Savanna, Illinois. Of these, only Benecia, San Antonio, and Ogden lay west of the Mississippi. The larger manufacturing arsenals lay at Rock Island, Illinois; Watertown and Springfield, Massachusetts; Watervliet, New York; and Picatinny, New Jersey.⁶⁹

The Great Depression and the Transformation of Utah's Economy

Undertaken by the WPA, the construction at Ogden Arsenal was part of a massive effort by the federal government and the state of Utah to lift the nation's and the state's economy from the depths of depression. Between the granting of statehood in 1896 and the Great Depression, Utahns had relied for economic growth principally on mining, smelting, stock raising, and railroading.⁷⁰ In a sense, Utahns lived in an economy beholden to the private sector and especially to national corporations--it became a colony of Wall Street.

⁶⁷Ogden Standard Examiner, April 25, 30, 1937, "Ogden Arsenal, Press Articles, 1936-1938," in Arsenal Miscellaneous data, HAFB History Office.

⁶⁸Maj. I. A. Luke, "Taken from Report and Summary of Activities, Fiscal Year 1939," in "Reconstruction Period, 1935-1939," "Ogden Arsenal History June 1920-1943," no pagination; Ray S. Odd, "The History of Ogden Arsenal for the Period of 22 April 1920 thru 30 October 1954 was Compiled by the Post Historical Officer," File "DOD Installations, Utah," Arsenal Miscellaneous data, HAFB History Office.

⁶⁹Salt Lake Tribune, December, illegible, 1938, in "Ogden Arsenal, Press Articles, 1936-1938, Arsenal Miscellaneous data, HAFB History Office.

⁷⁰Leonard J. Arrington, The Changing Economic Structure of the Mountain West, 1850-1950 Utah State University Monograph Series 10:3 (Logan: Utah State University Press, 1963), 54-58; Arrington and Alexander, A Dependent Commonwealth, *passim*.

During the early 1930s, these businesses along with the remainder of Utah's economy collapsed until more than a third of Utah's workers walked the streets looking for jobs.⁷¹

In his study of the impact of World War II on the American West, New Mexico historian Gerald D. Nash argues that during the period from 1939 through 1945, wartime necessity transformed the economy. In his words:

The colonial economy had been liberated; the foundations for another great population boom had been laid; sleepy western towns had been transformed into teeming cities; ethnic diversity had become a new reality in the everyday life of scores of communities in the region; and cultural isolation was largely ended as a diverse array of cultural and scientific institutions and activities was increasingly limiting the dominant influence of the East.⁷²

In Utah--and perhaps elsewhere in the West--the transformation actually began in 1933. Compelling evidence indicates that federal expenditures for work relief, especially through the WPA, began the west's transformation. In addition to various construction projects such as those at the Arsenal, on public buildings, and in water and sewer systems, the WPA hired artists, musicians, historians, and others to paint murals, start what became the Utah Symphony, copy documents, and write histories. Expenditures by federal agencies reduced Utah's unemployment from 36 percent in 1933 to 6 percent in 1936. Unemployment ranged between 6 and 10 percent until 1941 when the start of World War II in Europe and Asia led the United States to intensify preparations for defense. These preparations reduced unemployment nearly to 4 percent.⁷³

Nevertheless, in contrast to Nash's argument, instead of freeing itself from colonial domination, Utah traded domination by one colonial power for domination by another. In effect, during the 1930s Utah had begun the transformation from an old colonial economy based in Wall Street to a new colonial economy based in Washington. At first, Utah's prosperity rose and fell on the tides of spending for emergency construction projects. During World War II and after, War Department and Defense Department spending became prime movers in Utah's economy.⁷⁴

As the WPA began to allocate funds for this new construction, Utah and federal officials celebrated the importance of these expenditures. On September 9, 1936, Harry Hopkins officiated in a ground-breaking ceremony for the \$221,000 ammunition loading plant

⁷¹The best history of the 1930s is Wayne Kendall Hinton, "The New Deal Years in Utah: A Political History of Utah (1932-1940)" (M.S. thesis, Utah State University, 1963).

⁷²Gerald D. Nash, The American West Transformed: The Impact of the Second World War (Bloomington: University of Indiana Press, 1985), 201.

⁷³Alexander, Utah, the Right Place, 323, see also 319-335.

⁷⁴For evidence of the dimensions of these changes see Arrington, The Changing Economic Structure of the Mountain West, 1850-1950, especially 63.

at the Arsenal. On October 30, Governor Henry H. Blood drove a spike made of Utah silver donated by the Ogden Chamber of Commerce to celebrate the completion of a new railroad spur connecting the loading plant with the Bamberger Railroad. Congressman Abe Murdock, Senator King, and other local business and civic leaders attended as well.⁷⁵

World War II Influences Utah and the United States

By 1940, war had begun to engulf the world. After negotiating a nonaggression pact with the Soviet Union, Hitler sent the German Wehrmacht and Luftwaffe into Poland on September 1, 1939. Germany and the USSR partitioned Poland, and, in response, Britain declared war on Germany. In April 1940, Germany overran Denmark and Norway. The next month, Germany unleashed its blitzkrieg on Belgium, Holland, and Luxembourg. The army hardly paused for breath before sweeping on into France, which fell on June 22. The British forces escaped from the German siege at Dunkirk only by carrying off the stranded troops in virtually any seaworthy vessel. A year later, Germany broke its nonaggression pact with Russia, and Hitler launched an invasion of the USSR. In the meantime, Japan had continued its expansion in Asia, and Italy declared war on France.

In spite of the passage of additional neutrality legislation in 1936, 1937, and 1939, the United States drew closer to war. In each case until 1939, Congress tried to prevent Americans from supplying arms, trading with belligerent nations, or financing foreign military activities. Recognizing that the previous acts had penalized weak nations like China, Ethiopia, and Poland, in November 1939 Congress allowed Americans to ship war materiel to belligerents as long as the foreign nationals used their own ships and paid cash.

By the late summer of 1940 many Americans recognized that the United States needed to strengthen its forces to defend itself and the Western Hemisphere. Some had come to believe that American security depended on Great Britain's survival. To bolster the size of the American army, on September 6, 1940, Congress approved the first peacetime draft in American history. A conference at Havana, Cuba promised multi-lateral defense of the Western Hemisphere.

In August 1940, Germany launched its air attacks on Britain. In September Roosevelt agreed to transfer fifty overage destroyers to England in return for eight bases in the Western Hemisphere. In late 1940, Roosevelt and his congressional supporters pressed for the passage of a lend-lease act which would allow the United States to transfer war materiel to nations whose defense Americans considered essential to their own protection. The act finally passed in March 1941. In July 1941, Roosevelt ordered American ships to escort lend-lease shipments as far as Iceland, and shortly thereafter, American war vessels began to report the positions of German submarines. The Germans retaliated by torpedoing the destroyers Greer

⁷⁵Alexander, "'Arsenal of Democracy,'" 241; Deseret News, September 9, 1936, Salt Lake Tribune, October 30, 1936, in "Ogden Arsenal, Press Articles, 1936-1938," Arsenal Miscellaneous data, HAFB History Office.

and Kearny and sinking the Reuben James. Already the United States had embarked on an undeclared naval war with Germany.

As these events occurred, relations between the United States and Japan sank to new lows. The Japanese continued their expansion in China, and to encourage them to stop, in July 1941 the United States froze Japanese assets, promising to reopen trade when they withdrew from China. In late 1941, the United States imposed an embargo on the shipment to Japan of such items as scrap iron and aviation gasoline. After the Japanese government under General Hideki Tojo understood that the United States would refuse to release Japanese assets and would continue to embargo the shipment of scrap steel and oil unless Japan agreed to withdraw from China, Tojo's government concluded they must go to war with the Americans.

America Enters World War II

Believing that in order to win they had to neutralize the American Pacific Fleet, the Japanese adopted a two pronged tactic. Continuing to negotiate with the State Department in Washington, the Japanese launched a carrier task force commanded by Admiral Isoroku Yamamoto to mount a surprise attack on the Pacific Fleet at Pearl Harbor on December 7, 1941. The torpedoing, bombing, and strafing killed more than 2,400 people, made flaming wrecks of most of the war planes on Oahu, and destroyed or incapacitated the battleships moored around Ford Island. Fortunately for the United States, the Japanese missed the American carriers since they were at sea or in San Diego.

The war spread rapidly around the world. Concurrent with the attack on Pearl Harbor, the Japanese struck the Philippines, Guam, and Midway, and they launched strikes on the British and Dutch at Hong Kong and on the Malay Peninsula. On December 8, the United States declared war on Japan. On December 11 Germany and Italy declared war on the United States.

Even before the surprise attack on Pearl Harbor, the United States had begun to prepare for war by constructing new facilities at such places as the Ogden Arsenal and by training troops. Between July 1939 to December 1942, the Ordnance Department built new depots and expanded the capacity of existing depots. In the summer and fall of 1941, the department began constructing new depots in Kentucky and Pennsylvania in the east, and in the west at Herlong, California; Pueblo, Colorado; and Provo, South Dakota. The Army's General Staff allotted money for new storage space for general supplies at ordnance depots and arsenals at Letterkenny, Pennsylvania; Anniston, Alabama; Red River, Texas; Umatilla, Washington; Sierra, California; Sioux, Nebraska; Pueblo, Colorado; Wingate, New Mexico; Navajo, Arizona; Blue Grass, Kentucky; Seneca, New York; Black Hills, South Dakota; Tooele, Utah; and Ogden, Utah.⁷⁶

⁷⁶Thomson and Mayo, Procurement and Supply, 380-81, 384-85.

The War Department designated Ogden and seventeen other bases spread through the nation as bases for the storage of combat vehicles. Although contractors and government employees manufactured most of the artillery, tanks, and other combat vehicles in the midwest, the Ordnance Department decided to store as many as possible in the arid far west to minimize maintenance costs.⁷⁷

The Ordnance Department modified several buildings to support these motor base activities. Among them was B 1133 in which the Arsenal had previously stored obsolete ammunition. A 1942 renovation replaced the original wooden roof support with a steel truss capable of supporting a 2,000 lb. overhead crane to hoist vehicles for repair.⁷⁸

On March 2, 1942, slightly less than three months after the outbreak of the war, the War Department reorganized the army into three branches in a move that impacted Ordnance Department operations. The three branches were: Army Ground Forces, Army Air Forces, and Army Service Forces. The Ordnance Department came under the Service Forces command.⁷⁹

Munitions Manufacturing at the Arsenal:

The new construction inaugurated in the late 1930s set the Arsenal on a course that seemed likely to make it a major munitions manufacturing facility. The Arsenal's engineering department laid out and arranged buildings according to instructions from Washington. The buildings themselves followed detailed standard plans supplied by Picatinny Arsenal in New Jersey. Since the construction of powder and ammunition plants offered little attraction for private capital, the government built plants to manufacture the ammunition itself.⁸⁰

New facilities at the Ogden Arsenal opened between September 1941 and October 1942. These included the West Loading Plant, the East Loading Plant, the East Fuze Plant, the Primer Loading Plant, the North Loading Plant, and the West Fuze Plant.⁸¹

⁷⁷Thomson and Mayo, Procurement and Supply, 380-81, 384-85.

⁷⁸Mary Troutman, "Historic American Engineering Record, Ogden Arsenal, Motor Repair Shop," HAER No. UT-84-I.

⁷⁹Green, Thomson, and Roots, Planning Munitions for War, 90-91.

⁸⁰In some cases, standard plans were also furnished by Frankford Arsenal near Philadelphia.

⁸¹"Part Two, Industrial Division," 24-30. and "Part Two, Inspection Problems and Practices E 1 Procedures and Practices," 60, 64, Arsenal Quarterly Historical Report, April 1, 1943-June 30, 1943, Arsenal Miscellaneous data, HAFB History Office.

In 1942, for instance, the Ordnance Department constructed B 1607, a 321 x 50 ft. one-and-one-half-story structure for the loading and assembling of tetryl fuzes for 37 mm. anti-tank ammunition. In order to protect the integrity of the building and provide for the safety of workers, the builders divided the structure into sixteen 20 ft. wide bays separated by reinforced concrete shear walls.⁸²

As the erection of manufacturing and storage facilities proceeded, the Arsenal engineering department also supervised construction of additional support facilities. These included a new administration building, a sewage disposal plant, a machine shop addition, a utilities building, a locomotive repair shop, maintenance shops, and a telephone building.⁸³ Because of the addition of the 37 mm. shell loading plant, the Arsenal had to increase its water supply between February 1942 and mid-1943 by drilling new wells and pumping facilities.⁸⁴

Beginning with the opening of the first bomb loading plant on October 3, 1938, trains brought in components and employees at the loading plants manufactured shells on assembly lines. The ordnance manufactured at the Arsenal included various types of demolition bombs, 155 mm. Howitzer shells, 37 mm. armor piercing ammunition, and 20 mm. anti-aircraft ammunition.⁸⁵

The manufacture of 37 mm. anti-tank ammunition took place in buildings like B 2213 and B 2214. Workers disassembled and inspected inert ammunition bodies in B 2213. After loading them with tracer, igniter, and bursting charges, the workers sent the partially functional shells on to B 2214. Designed to minimize damage from accidental explosions, B 2214 consisted of a series of bays separated with concrete fire walls accessible only from the building's exterior. Using a profile and alignment gauge, blind operators fixed the projectiles in the shell casings. Workers then placed the assembled rounds in cylindrical fiber

⁸²Mary Troutman, "Historic American Engineering Record, Ogden Arsenal, Loading & Assembly Line Building," HAER No. UT-84-AG.

⁸³"Part Two, Building and Operations, Engineering Department, Ogden Arsenal Quarterly Historical Report, April 1, 1943-- June 30, 1943," 1-5, Arsenal Miscellaneous data, HAFB History Office.

⁸⁴"Part Two, Building and Operations, A Engineering Department," "Ogden Arsenal Quarterly Historical Report, April 1, 1943--June 30, 1943," 2-4, Arsenal Miscellaneous data, HAFB History Office. On the role of Picatinny and Frankford, see Thomson and Mayo, Procurement and Supply, 11.

⁸⁵*Ibid.*, 30-36.

containers. Other workers sealed the containers in wax before placing them in shipping containers.⁸⁶

Shortly after the outbreak of the war in December 1941, the army experienced a shortage of small arms ammunition arranged in fabric or metallic link belts for machine guns or packed in clips for rifles. Since ammunition came from the manufacturer in boxes containing cartons of unlinked shells, and owing to the need for the immediate supply of linked ammunition, the Ordnance Department constructed a temporary plant at the Arsenal in late December 1941 and early January 1942. Ogden Arsenal did not become the site of a permanent plant, but the temporary plant continued operation until October 15, 1942. Employees found conditions at the temporary plant extremely cramped and uncomfortable.⁸⁷

In carrying out these manufacturing operations, Arsenal employees had to invent, develop, or modify various types of machines and tools. This necessity arose because orders for various types of ammunition failed to include drawings or specifications for the machines used in the manufacture of various types of ammunition. Some of the machines Arsenal employees invented included a device for assembling and crimping 37 mm. ammunition, punches for pelleting presses used in processing explosives, drill presses used for manufacturing high explosive shells, and a linking machine designed to link any of standard loading ratios both for .30 and .50 cal. ammunition. The automatic linking machine invented by Capt. Harold Boehmer processed more than 500 cartridges per minute. With this machine, which cost about \$1,000 to manufacture, 3 men could do the work previously done manually by 30.⁸⁸

The manufacturing of munitions continued until August 31, 1943 when a change in the Arsenal's mission brought about the closing of the Industrial Service Division. The Arsenal command either released employees engaged in manufacturing operations or reassigned them to the Field Service Division to assist in receiving, storing, and shipping of various types of war materiel.⁸⁹

In spite of the closing of the Industrial Service Division, the Arsenal continued to repair and rehabilitate both artillery and small arms. During the last quarter of 1943, for

⁸⁶Mary Troutman, "Historic American Engineering Record, Ogden Arsenal, Warehouse/Assembly & Loading Line Building," HAER No. UT-84-BL.

⁸⁷"Part To Industrial Service Division, B 3 Small Arms Ammunition," "Ogden Arsenal Quarterly Historical Report, April 1, 1943--June 30, 1943," 33-36, Arsenal Miscellaneous data, HAFB History Office.

⁸⁸"Part Two Machine Tools, C," and "Part Two Inspection Problems and Practices E Data From Daily Activity Report," in "Ogden Arsenal, Quarterly Historical Report, April 1, 1943--June 30, 1943," Arsenal Miscellaneous data, HAFB History Office.

⁸⁹"Management," in "Ogden Arsenal Quarterly Historical report, 1 July - 30 September 1943," 2-4, Arsenal Miscellaneous data, HAFB History Office.

instance, the mechanical shops division repaired anti-aircraft guns, machine guns, rifles, revolvers, and shotguns.⁹⁰

Receipt, Storage, and Shipment of War Materiel at the Arsenal

In the construction that preceded America's entry into World War II, concurrent with the expansion of the manufacturing operations, the Ordnance Department had begun to expand the Arsenal's storage facilities. Between October 1940 and January 1942, the Ordnance Department constructed 40 additional warehouses, inert component storage buildings, and combat equipment storage units. Inundated by the demand for munitions and other war materiel created by the outbreak of war, between June and December 1942 the Ordnance Department constructed 36 additional warehouses at the Arsenal.⁹¹ The Arsenal command used buildings like B 1239, for instance, for bin storage, shelving, and equipment handling and for the circulation of general supplies.⁹²

Eventually the storage mission operations replaced the Arsenal's manufacturing operation. After America entered the war, the Army Service Forces became concerned with the efficiency of Ordnance Field Service operations. A study found that on the whole the various installations had failed to use more than half their available storage space, and the ASF altered the missions of a number of depots.⁹³ The new mission of the Ogden Arsenal eliminated manufacturing and concentrated on receipt, storage, repair, and shipment.

Before 1943, the Ordnance Department had divided depots into three types--reservoir, area, and transshipment. Ogden fit in the reservoir category since it provided long term storage for slow-moving munitions and other materiel. Area depots such as those at Pueblo, Colorado and San Antonio, Texas supplied materiel to various stateside posts and bases. Transshipment depots were generally those on the coast like Benicia which prepared goods for overseas shipment.⁹⁴

Further refining these plans, a reorganization in August 1943 concurrent with the elimination of manufacturing at the Arsenal, the Ordnance Department inaugurated a master depot system under which it designated every installation as a master, distribution, or storage

⁹⁰"Ogden Arsenal History, Quarterly Period 1 October 31 December 1943," 77-78, Arsenal, Miscellaneous Data, HAFB History Office.

⁹¹"Part Two D - Field Service," "Ogden Arsenal Quarterly Historical Report, April 1, 1943--June 30, 1943," 50-54, Arsenal Miscellaneous data, HAFB History Office.

⁹²Mary Troutman, "Historic American Engineering Record, Ogden Arsenal, Warehouse," HAER No. UT-84-O.

⁹³Thomson and Mayo, Procurement and Supply, 386-87.

⁹⁴Thomson and Mayo, Procurement and Supply, 387-89.

depot, or as an arsenal. Although designated a retail distribution depot, Ogden Arsenal acted much like a master depot since it stored and shipped a full line of ordnance and transportation equipment--vehicles, tanks, tractors, artillery, small arms, fire control equipment, parts, and miscellaneous supplies, for West Coast depots. By contrast, many of the distribution depots carried only a specific range of items.⁹⁵

From the arsenal's storage facilities, a stream of ammunition and general supplies poured in and out as the demand for materiel ebbed and flowed.⁹⁶

The August 1943, reorganization expanded the Arsenal's storage and shipment mission. The installation became a retail distribution depot for parts, supplies, tools equipment, wheeled and semi-wheeled vehicles, tanks, tractors, weapons, and fire control equipment for the Ninth Service Command (the Western United States). In addition, the Ogden Arsenal served as a backup storage depot for Stockton Ordnance Depot and Benicia Arsenal. These installations served as filler depots for the San Francisco Port of Embarkation. The Ordnance Department gave the Arsenal until December 1, 1943 to complete those renovations and reassignments necessary to meet this new responsibility. Finished with its preparations ahead of time, the Arsenal began filling requisitions from Fort Douglas, Utah and Boise, Idaho as early as November 1.⁹⁷

The change in mission of the Arsenal brought about a change in command. On October 28, 1943, Col. Webster A. Capron arrived to replace Col. Nickerson who was assigned to command Letterkenney Ordnance Depot, Pennsylvania. Seventh in seniority of cols. in the Ordnance Department, Capron had commanded the Hawaiian division at the time of the Pearl Harbor attack. In 1942, Capron transferred to command the Anniston Ordnance Depot, Alabama before his assignment to Ogden.⁹⁸

Under different geographical conditions, the Arsenal might have assumed an even larger storage and supply mission. A commission under the direction of Maj. Carroll Deitrick, who had previously commanded at Ogden Arsenal, considered the possibility of building even more extensive storage and shipment facilities at Ogden. Finding that

⁹⁵Thomson and Mayo, Procurement and Supply, 389; Odd, "History of Ogden Arsenal," 2; "Ogden Arsenal Quarterly Historical Report, April 1, 1943--June 30, 1943," References, 1, Arsenal Miscellaneous data, HAFB History Office.

⁹⁶"Data About Field Service Operations from Activity Reports," Ogden Arsenal, Quarterly Historical Report, April 1, 1943--June 30, 1943, Arsenal Miscellaneous data, HAFB History Office.

⁹⁷"Ogden Arsenal Quarterly Historical Report, 1 July - 30 September 1943," passim; and "Ogden Arsenal History, Quarterly Period 1 October - 31 December 1943," 6-7; Arsenal Miscellaneous data, HAFB History Office.

⁹⁸"Ogden Arsenal History, Quarterly Period 1 October - 31 December 1943, 1-4, Arsenal Miscellaneous data, HAFB History Office.

surrounding urban development offered insufficient room for expansion, Deitrick's committee recommended a site near Tooele. The new base, Tooele Ordnance Depot, provided ample storage and manufacturing space.⁹⁹

Unfortunately, the War Manpower Board did not recognize enormous responsibilities passed to the Arsenal with the closing of its manufacturing operations and the expansion of its supply operations, and in August 1943 it reduced the quota of civilian employees in the Field Service at the installation to 2,000. Many workers lost their jobs, and morale suffered as the unemployed found themselves reassigned at lower wages or--for the unlucky ones--pounding the pavement in search of work. These changes in fortunes bred bitterness in many--especially among those who had moved their families to Ogden over some distance and at some cost. The Arsenal spared some employees by reassigning them to functions which did not fall under Field Services such as Engineering and Transportation.¹⁰⁰ The post engineer retained some workers by assigning them to services previously contracted by outside businesses. These included insulating steam pipes, controlling pests in the Dormitory Village, weeding along the highways, laying bricks and stones, and glazing windows.¹⁰¹

Fortunately for most employees, the reduction in force necessitated by the closing of the manufacturing operations proved short lived. By the late fall of 1943, the expansion of the Arsenal's mission as the retail distribution depot for the Ninth Service Command actually created a shortage of certain types of employees. By December, unable to find enough workers, Capron began to recruit in surrounding states and among women in the Ogden area for clerks, typists, firemen, and laborers. He particularly called on "housewives who have had experience at the link and belt plant" to return.¹⁰²

As the United States expanded the war into areas occupied by German and Japanese armies, Ogden Arsenal became an even more critical link in the Ordnance Department's storage and shipment operations. In 1944, the department designated Ogden as a backup depot for Benecia Arsenal which it had assigned as the principal wholesale supply depot for the Ninth Service Command and for bases in the Pacific. In early 1944, the department

⁹⁹Thomson and Mayo, Procurement and Supply, 371-75, 378; "Building Operations, Period January 1, 1943 to March 31, 1943," in "Ogden Arsenal History June 1920 - 1943, Arsenal Miscellaneous data, HAFB History Office.

¹⁰⁰Management, 5-7, "Ogden Arsenal Quarterly Historical Report, 1 July - 30 September 1943," Arsenal Miscellaneous data, HAFB History Office. S. M. Strohecker, "Field Service Division," in Ogden Arsenal Quarterly Historical Report, 1 July 30 September 1943," 124-136, Arsenal Miscellaneous data, HAFB History Office.

¹⁰¹Ogden Arsenal Quarterly Historical Report, 1 July - 30 September 1943, 55, Arsenal Miscellaneous data, HAFB History Office.

¹⁰²"Ogden Arsenal History, Quarterly Period 1 October 31 December 1943," Arsenal Miscellaneous data, HAFB History Office.

added the Northwest Command (Pacific Northwest and southwestern Canada) to the Arsenal's responsibilities.¹⁰³

As large quantities of munitions and other materiel flowed into the Arsenal, employees had a difficult time finding places to store it. Late in 1943, the command decided to begin storing some munitions in the open. After the battering of winter, by March 1944 bombs in eight outside storage sites had begun to show signs of exterior rust. Inspectors concluded, however, that the rusting posed little danger since they believed the Air Force would use the bombs before the rust damaged their working parts.¹⁰⁴

In July 1944 as wartime conditions changed, the Arsenal's responsibilities expanded even more. Late in 1943, the War Department decided to concentrate its manufacturing operations elsewhere and on January 1, 1944 it closed the Remington Arms plant on Redwood Road in Salt Lake City, which had manufactured small arms ammunition. Since the Arsenal's responsibilities of receiving, storing, and shipping war materiel had increased dramatically, and since damaged and surplus materiel had begun to return in bulky shipments from the front, the War Department decided to reopen the Remington plant, and on July 6, 1944 it assigned supervision of the plant to the Ogden Arsenal. Under the command of Major Robert A. Bruce, employees the plant, renamed the Salt Lake Branch, segregated returned material, reconditioned that capable of repair, and released surplus materiel for disposal or sale. In essence, employees at the Remington Arms plant stopped manufacturing ammunition and began repairing war materiel.¹⁰⁵

Wartime Conditions Create Additional Problems

As a major manufacturing and storage facility, as the daytime home of thousands of employees, and as the full-time home for more than 1,500, the Arsenal faced problems associated with urban growth throughout the world. Wartime labor shortages made these conditions even more serious. During the second quarter of 1943, for instance, Capt. C. W. Bliss of the Plant Property Division had trouble securing enough employees to store the lumber for constructing buildings and shipping crates. Lumber piled up at loading docks

¹⁰³Thomson and Mayo, Procurement and Supply, 387-88.

¹⁰⁴"Ogden Arsenal, Quarterly History, Period 1 January 1944 - 31 March 1944," 46, Arsenal, Miscellaneous Data, HAFB History Office.

¹⁰⁵Thomas G. Alexander and Leonard J. Arrington, "Utah's Small Arms Ammunition Plant During World War II," Pacific Historical Review 34 (May 1964): 191-192; Salt Lake Tribune, November 10, 1944.

faster than Bliss's staff could move it out; and after filling one yard with lumber, he had to search out space for and open another.¹⁰⁶

As a byproduct of the feverish activity, the Arsenal's property division also found itself saddled with waste and salvage. The division devised creative ways of reusing or selling old and obsolete items. Employees salvaged truck parts for use as storage bins for small pieces of metal. They sold surplus and damaged bomb crates for kindling wood. They sold scrap metal recovered from World War I gun caissons and limbers to companies such as the Monsey Iron and Metal Co. and the Metal Salvage Co. of Salt Lake City for remanufacture. They found a market for scrap paper at the Spafford Waste Paper Company in Ogden. The property division found a market for some of the salvaged motors, housings, and front axles of trucks at nearby Hill Field.¹⁰⁷

The command could not dispose of all surplus material by sales. By the fall of 1943, a sizeable supply of defective ammunition had accumulated on the installation. In what today seems an environmentally destructive solution, the Safety and Surveillance Branch secured permission from the State Land Board and the Chief of Ordnance to dump the ammunition in Great Salt Lake. By the end of 1943 the branch had dumped five small boatloads of 37 mm. and 30 mm. shells, fuzes, and detonators in the lake.¹⁰⁸

In order to sample and analyze the chemical composition of supplies used for loading ammunition and to provide technical control for the processing and manufacture of explosives, the Arsenal established a chemistry department on June 1, 1942. The department operated under the direction of Professor Ralph S. Gray of the Weber College (now Weber State University) chemistry department. Housed at Weber College until facilities were opened in the West Fuze Plant in September 1942, the chemistry department operated until the closing of the Industrial Service Division on August 31, 1943.¹⁰⁹

Capt. Boehmer's Mechanical Shops Division continued the creative invention, testing, and repair of war materiel. Boehmer's workers modified cargo carriers; made pads for seat backs for 37 mm. antiaircraft guns; test fired 37 mm. guns; repaired electric generators, automatics, revolvers, shotguns, rifles, rocket launchers, and 37 mm. guns; modified rocket

¹⁰⁶"Plant Property Division," "Ogden Arsenal Quarterly Historical Report 1 July - 30 September 1943," 87, Arsenal Miscellaneous data, HAFB History Office.

¹⁰⁷"Plant Property Division," in "Ogden Arsenal Quarterly Historical Report, 1 July - 30 September 1943, 87-89, Arsenal Miscellaneous data, HAFB History Office.

¹⁰⁸"Ogden Arsenal History, Quarterly Period, 1 October-31 December 1943," 49-50, Arsenal, Miscellaneous data, HAFB History Office.

¹⁰⁹Ralph S. Gray "Report of the Work of the Chemistry Laboratory, Ogden Arsenal, 17 September 1943," "Ogden Arsenal Quarterly Historical Report, 1 July - 30 September 1943," 107, Arsenal Miscellaneous data, HAFB History Office.

launchers; and repaired optical equipment such as telescopes, range finders, and field glasses.¹¹⁰

Wartime Problems for Arsenal Employees

Employment at the Arsenal burgeoned during 1942 and 1943 only to decline in the fall of 1943 as the installation took on its new mission. During the fall of 1942 employment ranged from 6,600 to 5,950, more than half women. During the second quarter of 1943, Arsenal employment fluctuated between 4,600 and 5,000.¹¹¹ In October and November 1944 employment stood at more than 4400.¹¹²

Under wartime conditions as numerous new employees joined the staff, and as thousands of new workers moved into the Ogden area to find employment at the Arsenal and at other installations such as Hill Air Force Base, Utah General Depot, and Clearfield Naval Supply Depot, they encountered housing, food, and transportation shortages. In particular, the shortage of housing forced employees and their families to spend their off hours pounding the streets looking for shelter. Because of the ample number of tenants, many property owners refused to rent to families with children. This created additional problems for families.¹¹³

To confront this crisis, the federal government constructed a number of housing projects in south Weber County-north Davis County. These included: Grandview Acres, Bonneville Park, and Washington Terrace in Ogden and Sahara Park, Verdeland Park, and Anchorage Acres in north Davis County. In addition, numerous people living in single-family homes took in renters or friends in an attempt to meet the demands of the war effort.¹¹⁴ Nevertheless, a survey by Arsenal personnel in 1942 found employees living in trailer camps, gas stations, and even in converted fruit stands under "appalling . . . sanitary

¹¹⁰Harold Boehmer, "Mechanical Shops Division," in "Ogden Arsenal Quarterly Historical Report, 19 July - 30 September 1943," 114-123, Arsenal Miscellaneous data, HAFB History Office.

¹¹¹Employment figures generalized from the Quarterly Historical Reports, Arsenal Miscellaneous data, HAFB History Office.

¹¹²"Ogden Arsenal, Quarterly Historical Report, 1 October 31 December 1944," Arsenal, Miscellaneous Data, HAFB History Office.

¹¹³"Ogden Arsenal, Quarterly Historical Report, April 1, 1943- - June 30, 1943, 33, in Arsenal Miscellaneous data, HAFB History Office.

¹¹⁴James B. Allen, "Crisis on the Homefront: the Federal Government and Utah's Defense Housing During World War II," Pacific Historical Review 38 (November 1969): 407-28.

conditions." As a stopgap measure, the command housed 200 people in renovated Civilian Conservation Corps structures at Bountiful, which it renamed with unconscious irony, "Camp Bountiful." In 1942 and early 1943 the Arsenal constructed a Dormitory Village to accommodate 1500 workers. In 1943-44 the base constructed a housing project near the Sunset gate to house key personnel. In order to try to make the housing stretch as far as possible and to avoid favoritism, federal housing officials allocated a quota at the defense housing projects to each of the installations. Arsenal employees, for instance, could occupy only 391 homes at Washington Terrace during the second quarter of 1943.¹¹⁵

Recognizing the spartan conditions in the Dormitory Village, the Arsenal administration tried to work with the employees' association and the village advisory council to improve the facilities. In the summer of 1943, the command oiled the roads and planted grass throughout the village. Workers cleaned the recreational building and outfitted a room in it for church services.¹¹⁶ In addition, the administration opened a barber shop, installed clothes lines, cleared a soft ball diamond, added screen doors to windows, varnished floors, and enlarged post office and canteen facilities. To minimize intrusion and facilitate privacy, the command assigned women guards to patrol the women's barracks and recreation rooms.¹¹⁷ Other amenities at the village included a theatre company, dancing, bowling, golf, boxing, softball, and baseball.¹¹⁸

Still, privacy and peace came at a premium at the dormitories. Some employees disturbed others by playing a juke box at the canteen late at night. Complaints about these disturbances led to a rule which required those who wanted to hear music after 11:00 p.m. to move to the cafeteria, out of hearing of the living quarters. Bed bugs and other vermin tormented dormitory residents. The management tried to eradicate the bugs by using a commercial spray. When this failed, they turned to cyanide gas. The gas proved effective, but it also posed a health hazard to the employees, so the command banned its use.¹¹⁹

During the summer of 1943, the Arsenal employees association sponsored a large number of recreational activities. On July 4, 120 employees made a bus trip to Como

¹¹⁵"Ogden Arsenal Quarterly Historical Report April 1, 1943 - - June 30, 1943," 33, and "Part Two, Training and Personnel, Civilian Personnel, B-1, 138 in *ibid.* Arsenal Miscellaneous data, HAFB History Office.

¹¹⁶Management, in "Ogden Arsenal Quarterly Historical Report, 1 July - 30 September 1943," Arsenal Miscellaneous data, HAFB History Office.

¹¹⁷"References," 16-18, Quarterly Historical Report, April 1, June 30, 1943, Arsenal Miscellaneous data, HAFB History Office.

¹¹⁸*Ibid.*, 24, 26.

¹¹⁹Management in "Ogden Arsenal Quarterly Historical Report, 1 July- 30 September 1943, Arsenal Miscellaneous data, HAFB History Office.

Springs in Ogden Valley for an outing. Later in July 108 employees toured Timpanogos Cave National Monument in American Fork Canyon, and 100 employees attended a concert produced by a troupe from Hill Field.¹²⁰

By the fall of 1943, though some problems remained, much of the housing shortage had ended. The Arsenal command found itself unable to fill all of the units allocated to its employees at Washington Terrace, and officials reported that it placed most applicants "within a week or so." Still families with children found difficulty in securing furnished apartments.¹²¹

Most Americans undoubtedly considered the defeat of Nazism, Fascism, and Japanese imperialism important enough for the sacrifices they had to pay. Nevertheless, the war damaged families in various--often tragic--ways. The Borgstrom family of Tremonton, northwest of Ogden, for instance, suffered more than most. After four of Boyd Borgstrom's brothers had died in combat, the Marine Corps released him from active duty. Anxious to contribute to the war effort, Boyd got work in the Arsenal's Small Arms Repair Shop.¹²²

Engaging, Training, and Retaining Employees

The Arsenal administration faced a particularly difficult problem of taking men and women with little previous experience and training them for specialized manufacturing and warehousing jobs. During the second quarter of 1943, for instance, the Arsenal trained more than 1,500 employees--about a fourth of the command--a quarter of them women. The command also sent 75 employees to other installations and trained 11 employees from other depots. The Arsenal set up training courses for various positions including IBM operators, key punch operators, storekeepers, fork-lift operators, clerks, checkers, fire fighters, bomb reconnaissance specialists, guards, and supervisors.¹²³

Even though the command invested a great deal of time and money in training the new employees, it experienced a turnover rate of 7 to 9 percent. During late 1942, nearly a year after the outbreak of the war, the rate of turnover became a serious problem. As fruit, tomatoes, and sugar beets ripened and the harvest began, and as the canning season reached

¹²⁰Management, in "Ogden Arsenal Quarterly Historical Report, 1 July - 30 September 1943, 42, Arsenal Miscellaneous data, HAFB History Office.

¹²¹"Ogden Arsenal History, Quarterly Period 1 October - 31 December 1943," 24-25, Arsenal Miscellaneous data, HAFB History Office.

¹²²"Ogden Arsenal, Quarterly Historical Report, 1 October - 31 December 1944," 27, Arsenal, Miscellaneous Data, HAFB History Office.

¹²³"Ogden Arsenal, Quarterly Historical Report, April 1, 1943- - June 30, 1943," 31-32, and "Training and Personnel, Civilian Personnel," np, Arsenal Miscellaneous data, HAFB History Office.

its peak, many workers resigned or took leaves of absence to work on their farms or to take jobs in canneries. In fact, for a short time the number of employees resigning from the Arsenal exceeded the number of new recruits. To combat this disastrous condition, the Arsenal's personnel director began to advertise in nearby states to recruit new workers.¹²⁴

The Arsenal sought employees from unconventional sources. By June 1943 23 blind and 15 deaf workers had proved "very efficient" in their various duties.¹²⁵

Most significantly, under the pressure of wartime conditions, the Arsenal turned to women to fill the gap left by men who joined the armed services. After studies showed that women could do the work of shell loading as effectively as men, the Arsenal inaugurated an extensive program of recruitment among local housewives, widows, and elderly women. The command found that older women effectively mastered the technical skills needed in the primer plant, and many women signed on for part-time work. The command hired women to drive trucks and ambulances, to work in the shipping department, and even to work as guards. Finally in November 1942 after some foot-dragging by managers who thought women incapable of heavy labor, studies showed that even in the bomb loading plant women had the strength to "successfully carry out most every job formerly assigned to men."¹²⁶

With the increase in the employment of women and the general dearth of able-bodied men, the Arsenal opened a day nursery. First opened in Layton at the American Legion Hall November 2, 1942, the nursery hired a staff of well trained workers who provided meals, indoor and outdoor activities, and rest periods for the children. In April 1943, in cooperation with Utah General Depot, the Arsenal opened an additional nursery at the First Baptist Church in Ogden.¹²⁷

The reduction in personnel in August 1943 occasioned by closing the Industrial Division solved some problems at the Arsenal and changed conditions. Col. Nickerson ordered the closing of a base-operated day nursery on August 1.¹²⁸ The nursery in Ogden,

¹²⁴"Part Two Training and Personnel, Civilian Personnel, B-1," 133-135, in "Ogden Arsenal, Quarterly Historical Report, April 1, 1943-June 30, 1943," Arsenal Miscellaneous data, HAFB History Office.

¹²⁵"Part Two, Training and Personnel, Civilian Personnel, B-1," 136 in "Ogden Arsenal, Quarterly Historical Report, April , 1943--June 30, 1943," Arsenal Miscellaneous data, HAFB History Office.

¹²⁶"Part Two Training and Personnel, Civilian Personnel, B-1," 135, in "Ogden Arsenal, Quarterly Historical Report, April 1, 1943-June 30, 1943," Arsenal Miscellaneous data, HAFB History Office.

¹²⁷*ibid.*, 22.

¹²⁸Management, "Ogden Arsenal Quarterly Historical Report, 1 July - 30 September 1943," 41, Arsenal Miscellaneous data, HAFB History Office.

however, continued to operate, and those employees who could find no one to care for their children often sent them there.¹²⁹

After Italy's surrender in April 1944, the Arsenal found an additional source of help. The victorious allies worked out an agreement with the Italian government to allow prisoners of war held in the United States the option of working at military installations. Those who chose to do so organized what were called Italian Service Units (ISU) under the command of Italian and American officers. In the first quarter of 1945, for instance, between 400 and 600 ISU personnel worked at the Arsenal, assisting in the receipt, storage, and shipment of war materiel.¹³⁰ By early 1945, Col. Frank M. Browning of Ogden, who, as a member of the Ogden Chamber of Commerce had been so influential in reconstructing and expanding the Arsenal during the 1930s, had returned to the United States. Browning, who had served in Iran shipping supplies to the Soviet Union, assumed the position of post operations officer. In this capacity, he shouldered the responsibility for supervising the ISUs.¹³¹

Faced with problems of maintaining employee morale, the Arsenal offered additional employee benefits. To allow employees convenient access to banking services, the command authorized First Security Bank to open a branch bank on the base.¹³² In the early spring of 1944 at the suggestion of Col. Capron, employees organized a credit union.¹³³

Understanding the need for contented employees, the command worked to help employees secure food. Early in the war, shortages, wartime needs, and the "freezing" of food for civilians, left many items scarce. In October 1942, a freeze on canned foods left grocers with access only to the cans already on their shelves. In an attempt to free some supplies, the Arsenal administration sent a representative to the midwest to scrounge food for the employees. He managed to locate three carloads of canned food in the hands of wholesalers. Finding the food did not end his problems because a freeze on supplies for civilians made it illegal to ship the food to the Arsenal. Undaunted, he went to Washington

¹²⁹"Ogden Arsenal Quarterly Historical Report, 1 July-30 September 1943, 72, Arsenal Miscellaneous data, HAFB History Office.

¹³⁰"Ogden Arsenal History, Quarterly Period 1 January - 31 March 1945," 28, Arsenal, Miscellaneous Data, HAFB History Office.

¹³¹Ogden Standard-Examiner, May 6, 1945; "Ogden Arsenal Quarterly Historical Report, 1 January - 31 March 1945," Arsenal Miscellaneous Data, HAFB History Office.

¹³²"Administrative and Management," "Ogden Arsenal, Quarterly Historical Report, April 1, 1943-June 30, 1943," 5, Arsenal Miscellaneous data, HAFB History Office.

¹³³"Ogden Arsenal Quarterly History, Period 1 January 1944- 31 March 1944," 17, Arsenal, Miscellaneous Data, HAFB History Office.

where he convinced officials that supplies of munitions and other war materiel constituted a serious wartime necessity.¹³⁴

Rising to cope with the emergency, the Arsenal employees' association tried to make a dent in the food shortage by operating a farm. After leasing the T. Joseph Steed Ranch near Syracuse, a small town southwest of the Arsenal, the association engaged an agricultural economist from the Utah State Agricultural College (now Utah State University) at Logan to help formulate plans for the management of dairy, beef, and hog herds. In June of 1943, for instance, the employees milked 40 cows. After pasteurizing the milk, the employees turned the milk over to Arsenal's food services which offered it at base cafeterias. At the farm the Arsenal produced most of its own meat, "alleviating to a great extent the [wartime induced] meat shortage." Several hundred hens provided a case of eggs a day for use at Arsenal tables, and the farm purchased baby chicks which employees raised and slaughtered for food. At the farm's victory garden employees grew peas, beans, and tomatoes which they canned, packed in cases, and distributed to Arsenal personnel.¹³⁵

Shortages occurred in supplies other than food as well. The command assisted the employees in securing ration books for gasoline, tires, and other scarce items.¹³⁶ In order to try to save tires from unnecessary wear, Col. Capron ordered the Automotive Transportation Division to equip a truck with a compressor and hose. The division then sent the truck to "patrol the Post checking and inflating or deflating tires according to their requirements."¹³⁷

As an employer interested in promoting contentment among its workers, the command offered the services of the Arsenal's legal department to provide advice on various questions of law. In addition to such normal legal services as preparing agreements for the command, the legal department wrote a constitution for the Arsenal employees' association, handled

¹³⁴"Training and Personnel, Report of Ora Smith of Procurement, Food," "Ogden Arsenal, Quarterly Historical Report, April 1, 1943-June 30, 1943," Arsenal Miscellaneous data, HAFB History Office.

¹³⁵Ibid., 25. and "Part Two, Legal and Fiscal, H. 1 Legal Department," 94, "Ogden Arsenal, Quarterly Historical Report, April 1, 1943--June 30, 1943," Arsenal Miscellaneous data, HAFB History Office.

¹³⁶"Ogden Arsenal Quarterly Historical Report, April 1, 1943- - June 30, 1943," 40-41, in Arsenal Miscellaneous data, HAFB History Office.

¹³⁷"Ogden Arsenal History, Quarterly Period 1 October-31 December 1943," 68, Arsenal Miscellaneous Data, HAFB History Office.

matters relating to landlord and tenant laws, and advised on such matters as health and child welfare, naturalization, obligations of automobile drivers, and group insurance.¹³⁸

In addition to the shortages of food and housing, wartime conditions created serious inflationary pressure. Wage increases tended to lag behind the rise in prices, and many employees became dissatisfied with incomes that failed to buy the goods and services they needed. To address this problem, in March 1944, Col. Capron brought in William T. Brokaw, former chief of the classification section at Anniston Ordnance Depot, Alabama and Katherine C. Rose, former chief of the Air Base Classification section from Salt Lake City, to conduct a study with a view to regrading wage scales.¹³⁹

As commanding officer during 1943, Col. Lewis A. Nickerson, worked to promote patriotism among employees. Perhaps the central feature of the patriotism drive was the effort to fill the Arsenal's quota in the various war bond drives. Within a week of the opening of the nation's third bond drive in 1943, the Arsenal had oversubscribed its quota of \$50,000 by 25 percent. The Treasury Department recognized this effort by awarding the Arsenal its "T" flag for bond subscriptions.¹⁴⁰ Col. Capron continued these bond drives.

After assuming command in October 1943, Col. Capron inaugurated a number of measures to help in improving employee morale. The major layoffs and transfers of late August had already occurred, and Capron faced the problem of continuing Nickerson's work of improving morale while integrating new and transfer workers into existing divisions. Taking the opportunity of a visit by Utah Gov. Herbert B. Maw and a party of high state officials, Capron had one of the women employees, Thelma Read of Ogden, call attention to the red, white, and blue suggestion boxes hung in various buildings. Read pointed out that the boxes had been placed to solicit ideas from the employees. "If," Read said, "our suggestion is accepted, we get a reward." Enlarging on the opportunity, Capron pointed out that the Arsenal benefited all people when it avoided "extravagance and waste" and when employees found "better ways of doing our jobs." Employees appreciated the small monetary reward and the recognition they received as well.¹⁴¹

The End of the War and the Interwar Period

¹³⁸"Part Two, Legal and Fiscal H 1 Legal Department," 94-99, in "Ogden Arsenal, Quarterly Historical Report, April 1, 1943--June 30, 1943," Arsenal Miscellaneous data, HAFB History Office.

¹³⁹"Ogden Arsenal Quarterly History, Period 1 January 1944 - 31 March 1944," 4, Arsenal, Miscellaneous Data, HAFB History Office.

¹⁴⁰Management, in "Ogden Arsenal, Quarterly Historical Report, 1 July - 30 September 1943," Arsenal Miscellaneous data, HAFB History Office.

¹⁴¹"Ogden Arsenal History, Quarterly Period, 1 October - 31 December 1943," 9-10, Arsenal Miscellaneous data, HAFB History Office.

As the Allies took the war to the German homeland in late 1944 and early 1945, the war heated up in the Pacific and in Asia as well. Admiral Nimitz's carrier task forces carried troops who fought bloody battles on strategically placed Pacific Islands like Saipan, Iwo Jima, and Okinawa.

The Arsenal became one of the busiest shipment centers in the western United States. Freight car loadings increased during late 1944 and early 1945 as the Arsenal dispatched munitions and supplies. During May 1945, the railroad transportation division processed more than a million pounds of freight daily.¹⁴²

Inevitably bullets, explosives, and the wear and tear of battle damaged guns, rifles, and other equipment. Much of the damaged materiel returned to the Arsenal for repair. The small arms section attacked piles of carbines, machine guns, pistols, rifles, restoring them to serviceable condition and discarding the unrepairable. The artillery section repaired 40 mm. guns, 105 mm. Howitzers, and mortars. Optical and fire control sections refurbished damaged binoculars, aiming circles, sights, clocks, and watches.

The Arsenal also became a major repair center for the railroad equipment which carried arms and munitions to ports of embarkation. The army designated the Arsenal as a major locomotive repair center for the Ninth Transportation Zone. As the war heated up during early 1945, other zones shipped their locomotives to the Arsenal as well, and Arsenal shops repaired locomotives for the seventh, eighth, and fourth zones as well.¹⁴³

After the surrender of Japan in August 1945, the Arsenal continued to operate much as before until November 1945. Then, as troops and materiel returned from Europe, the Pacific, and Asia, the War Department ordered a reduction in force. The reduction shrunk the number of employees from 3500 in December 1945 to 3100 by January 10, 1946. By June 1946, employment had declined to 1,500. In order to buffer the separation, Col. Capron insisted that employees receive thirty days notice, including fifteen days of leave time to help them search for new jobs.¹⁴⁴

Where during the early months of the war, the Arsenal had engaged in manufacturing munitions, following the war, it faced the problem of taking ammunition apart. Still on the job, Maj. Harold Boehmer invented a device that safely dismantled .30 cal. ammunition--extracting the projectile, segregating the propellant charge, and separating the case. The

¹⁴²"Ogden Arsenal History Quarterly Period 1 April - 30 June 1945," Arsenal Miscellaneous Data, HAFB History Office.

¹⁴³"The Bombshell" April 20, 1945, included in Ogden Arsenal History, Quarterly Period 1 April - 30 June 1945," Arsenal, Miscellaneous Data, HAFB History Office.

¹⁴⁴W. A. Capron to All Civilian Employees, November 15, 1945, in "Ogden Arsenal History, Quarterly Period 1 October - 31 December 1945," Arsenal Miscellaneous Data, HAFB History Office.

machine that Maj. Boehmer invented disassembled munitions eleven times faster than previously existing machinery.¹⁴⁵

The storage of reserve materiel and sale of surplus became a major preoccupation of Arsenal personnel. A large number of Sherman and Pershing tanks, amphibious landing craft, half-tracks, armored cars, and scout cars moved into storage at the Arsenal. In December 1945, the installation announced the sale of \$40 million worth of hardware, power tools, hand tools, and automotive parts. This became the first of a series of massive disposal sales. Guns, rifles, jeeps, and virtually every sort of war materiel went on the block.¹⁴⁶

By mid-1946, the Ordnance Department faced a major supply problem that made even that after World War I appear minor. Some supplies remained in nations occupied by the United States, but much flowed back to North America. Nearly half of the supplies were "battle-worn and in need of repair." Large quantities deteriorated, ravaged by the elements in open storage. Under the circumstances, the department faced a serious problem of identification, repair, and processing for storage. Employees had to prepare surplus items for disposal. New customers appeared in the civilian market and in foreign nations under foreign aid programs like the Marshall plan.

The Origins of the Cold War and a Hot War in Korea

Within five years after the War's end, however, conditions had changed in ways few in 1945 would ever have predicted. With the defeat of Germany and Japan, a power vacuum developed in Europe and Asia. War-battered and virtually prostrate, England and France proved unable to regain their pre-war dominance. The Nationalists and Communists gripped China in a civil war that led to Nationalist defeat and Communist supremacy by 1949. Though battered and drained, the United States and the Soviet Union emerged from the war as the only nations with sufficient military power to pour into the vacuum.

As Winston Churchill put it, an Iron Curtain descended over central Europe, and by analogy a Bamboo Curtain fell over eastern Asia. Russia assembled the Warsaw Pact of nations dedicated to its goals, and the United States and its allies organized the North Atlantic Treaty Organization.

In the meantime, the United Nations became a sounding board for east and west as America and the Soviet Union sought to win in what came to be known as the Cold War.

¹⁴⁵"Ogden Arsenal History, Quarterly Period 1 January - 31 March 1945," K-1, Arsenal Miscellaneous Data, HAFB History Office. The Bombshell, October 25, 1945 in "Ogden Arsenal History, Quarterly Period 1 October - 31 December 1945," Miscellaneous Data, HAFB History Office.

¹⁴⁶"Ogden Arsenal History, Quarterly Period 1 October - 31 December 1945," 62--79, Arsenal Miscellaneous Data, HAFB History Office.

The Soviets occupied eastern Europe, Sakhalin Island, and the Kuriles. The United States occupied Western Europe, dividing the occupation with the British and French. Korea and Vietnam became divided states.

This uncertain post-war world forced the Arsenal into conditions not unlike a roller coaster. Following the end of the war, the Arsenal rushed into its first downgrade. On November 1, 1949, Ogden Arsenal became a subdepot of the now-larger Tooele Ordnance Depot. In the process, the Ordnance Department redesignated it as Ogden Sub-Depot.¹⁴⁷

In June 1950, the installation rushed toward a new peak. On June 25th North Korean troops swarmed across the 38th Parallel which had divided North from South Korea in an invasion of South Korea. With United Nations approval, the United States embarked on a "police action"--a war in all but name--to protect South Korea from North Korea and then from the People's Republic of China. On July 14, 1950 the Ordnance Department removed Ogden Arsenal from TOD supervision and it again became a separate installation.¹⁴⁸

The new demand for war materiel placed additional pressure on the installation, now redesignated Ogden Arsenal. By June 1946 fewer than 1,500 employees had reported for work at the Arsenal, by 1953 employment had again risen to more than 3,000. Assembly lines which had closed during World War II reopened, as Arsenal personnel constructed a variety of munitions including 60 mm. illumination shells, 81 mm. mortar shells, and M-26 grenades. Women, many of whom had left for home and family returned to work--many at the same jobs they had performed in World War II. The Arsenal inaugurated a mechanic-learner program in cooperation with Weber College to train the employees needed in this new work. Workers returned to the refurbishing of small arms ammunition, sandblasting their surfaces and acid surfacing to retard corrosion under shipment and battle conditions.¹⁴⁹

Closing Down the Arsenal

After the treaty of Panmunjom of July 27, 1953 which ended the Korean War, the Arsenal raced into another downgrade. The separation of the Air Force from the Army in 1947, the creation of the Defense Department in 1949, and the development of tactical and strategic jet aircraft and missiles required a major expansion of the Air Force and a relative reduction of ground forces. The creation of coordinate branches of Army, Navy, and Air Force under subordinate secretaries, left the Army with a different ordnance role and the Air Force with a much larger one.

In 1954, the Air Force and Army mapped out their post-Korean War missions. The Air Force needed additional space for its flight, storage, and maintenance operations, and the ordnance department needed facilities with more room for expansion than the Arsenal

¹⁴⁷Odd, "History of Ogden Arsenal," 2-3.

¹⁴⁸Odd, "History of Ogden Arsenal," 3

¹⁴⁹Alexander, "Ogden's Arsenal of Democracy," 245.

offered. The Defense Department recognized the need to consolidate army operations at fewer but larger depots, and it selected seven for transfer to the Air Force. Military planners realized that although the Arsenal had little future as an army installation, its property lay in the way of the expansion of Hill Air Force Base which had become an important link in the Air Materiel Command's system of storage and repair facilities.¹⁵⁰ Davis County cities lay on the West and South, the Weber River Valley created a canyon on the North, and the Wasatch Mountains rose on the east. Neither Hill Air Force Base nor the Arsenal could expand without impacting the other. At the same time, Tooele Ordnance Depot had wide open space for expansion in the desert to the west. The Air Force needed additional land for the expansion of its runway system, the Arsenal's igloos offered storage facilities for air munitions, and the housing, administration, warehouse, and mess facilities promised more adequate service for air personnel.

By mid-1954, Defense Department planners had decided to bring the Arsenal's roller coaster to a halt. A plan of October 6, 1954 laid out the transfer of the various facilities.¹⁵¹ On April 1, 1955 the War Department transferred all ordnance functions at the Arsenal to Tooele Ordnance Depot. The army retained a railway repair shop, but placed it under the jurisdiction of Utah General Depot (later renamed Defense Depot Ogden).¹⁵²

The Arsenal had served nearly thirty-five years, much of the time as a significant link in America's defense establishment. By 1955 conditions had changed. The Ordnance Department needed a larger area than the Arsenal afforded to test, repair, and store its increasingly sophisticated materiel. The Air Force needed room for its new generations of missiles and tactical air planes. The Arsenal could not supply the space the Ordnance Department needed and it stood in the way of Air Force expansion. Under the circumstances, its storage magazines, repair facilities, and administrative buildings could continue to serve in the nation's defense, but as part of an Air Force installation.

¹⁵⁰"History of the Ogden Air Materiel Area, 1 January-30 June 1955" 2 vols, On File at Office of History, Ogden Air Logistics Center, HAFB, I: 1-2.

¹⁵¹"Facility Transfer and Utilization Agreement Incident to transfer of the Ogden Arsenal, Ogden Utah," draft October 6, 1954, Industrial Division, Ammunition Branch, plans and Policies Office, 1950-55, Box 1-108, RG 156, National Archives.

¹⁵²Alexander, "Ogden's Arsenal of Democracy," 246.

OGDEN ARSENAL:
Storing, Supplying, and Manufacturing Army Ordnance, 1920-1945

Meager Beginnings: The Birth of a Reserve Depot, 1920-1935

Few structures remain from the initial stage of the history of Ogden Arsenal. The origin of the Arsenal as a reserve facility, designated Ogden Ordnance Reserve Depot in November 1921, did not necessitate many significant support structures. The most important buildings of this period were the Standard Ammunition Magazines used to store ordnance of all kinds. The US Army built a total of 35 of these specially-designed structures in 1920/1921 on a plateau east of the main service and administrative facilities. Building 1471 is one of only five standard magazines, identical in design and function, that survived a severe 1927 windstorm that destroyed most of the Arsenal buildings (the others that survived are Buildings 1476, 1374, 1375, and 1376). These buildings, each measuring roughly 219' x 52', are one-story, gable-roofed, hollow-tile buildings located in the original Magazine Storage area. This area now consists mostly of igloo-type magazines, with a few remaining building-type magazines like these. Originally, these buildings formed part of a network of structures designed to store left-over and obsolete ammunition from World War I.

The military erected several other buildings to support this munitions storage work at the Reserve Depot as it became operational in the early 1920s. By the end of 1921 a combination administrative and residential building had been constructed, as well as transportation maintenance facilities to support the railroad locomotives and other vehicles involved in transporting ordnance to and from the Reserve Depot. An elegant red-brick structure, Building 1118 served as both administrative offices and housing for bachelor officers from 1921 until the middle of World War II. The officers living there supervised the ordnance operations during this period. A protruding, pediment-capped central bay and an associated small entryway porch with classical columns combine with the decorative brick quoins at the building's corners to announce its Colonial Revival architectural style. Now known as the Hobson House, this was the first building erected in the prestigious General's Loop area and it provided the architectural precedent for the Arsenal's residential and administration area.

Buildings 1132 and 1133 are two other early structures that also survived through the World War II period and beyond. They persist as representatives of the installation's early transportation support and maintenance facilities. The Locomotive Shop and Shelter (1132) provided secure space for the repair and maintenance of army-owned locomotives. This one-story maintenance shop of brick construction, of which a massive beige-brick chimney standing sixty feet tall is a prominent feature, played a critical early role on the base. Before and during World War II, Ogden Arsenal contained a vast network of railroad tracks and ran trains for immense delivery and shipping purposes. Rail transportation was the primary method of shipping goods to and from the Arsenal, as well as between the various ammunition manufacturing plants on the military base and their associated storage magazines.

The Locomotive Shop originally contained two separate locomotive repair bays with individual tracks. Locomotives accessed each bay on the north side of the building through large steel rolling-type doors over the tracks. Both repair stations featured a ten-ton capacity overhead traveling crane used to hoist out heavy or awkward parts. One bay was equipped with an underground pit that provided accessibility to equipment on the underside of locomotives. Workers removed parts from the locomotive and then carried them into adjacent work rooms for repair. They may have serviced some items in the Motor Repair Garage (Building 1133).

Due to the rapid expansion of Ogden Arsenal on the eve of and during World War II, the locomotive repair needs of the Arsenal grew beyond the capacity of this small building. When a new Locomotive Repair Shop (Building 1701) with the capacity to service eight locomotives at a time was completed in 1942, the Army converted Building 1132 into a machine shop and welding shop that supported the locomotive repair activities in the newer building. At the same time they maintained one set of tracks running into the building so that it could be used as an overflow repair facility when Building 1701 was full.

Building 1133 provided shelter for the repair, maintenance, and modification of motor vehicles. During the 1930s and early 1940s, this building may have been used to repair locomotive engines or other parts removed from locomotives in the original Locomotive Shop (Building 1132). A one-story, gable-roofed maintenance shop with poured-in-place concrete walls, it is also located in the northern section of the General's Loop area. The Army modified it in 1942 to achieve a more efficient working environment. They replaced the original wood roof-framing system with a steel truss in order to support a 2,000 pound overhead crane used to hoist engines in and out of motor vehicles. That same year, they added a small parts storage room, office, and chauffeur's room to the west side of the building.

Between 1925 and 1935 many of the Depot's structures deteriorated, neglected by a military with little use for the facilities. A severe wind storm in June 1929 seriously damaged many buildings and the Army did little to repair or rehabilitate them until events in Europe and East Asia in the mid-1930s made the Arsenal a more valued installation.

Rebirth through War: From Reserve Depot to Active Arsenal, 1936-1945

World events and the related need of the United States to strengthen its military caused increased action in the production and storage of munitions, and revived the Ogden Arsenal. Besides rejuvenating the storage facilities, the Army expanded the Arsenal's mission to include the production of munitions as well as storage and supply. As World War II approached, the Arsenal served as an ammunition storage base for the Army Air Corps and distributed items of ordnance supply and equipment to all areas and stations in the western United States. During this period, storage facilities multiplied more than tenfold, and the Arsenal began large-scale manufacturing of munitions. By the fall of 1943, Ogden Arsenal's mission changed, gaining a sharper focus. The Army dropped the munitions manufacturing side of the installation's mission and focused its

mission on receiving, storing, and shipping Army ordnance. From this point until the end of the War, efforts centered on the Warehouse area and the storage and supply operations, along with the related task of ordnance reclamation, at Ogden Arsenal. As evidence of the new focus, the Warehouse area saw the only new construction of facilities during this period.

MANUFACTURING

In 1938, the Works Progress Administration built Building 1420 for the Army as part of the Arsenal reconstruction project. Although this building originally served as a warehouse, it became part of the first Bomb Loading Plant in October 1939. The people working in Building 1420 wore special masks and coveralls, but no accommodations were made to the building's ventilation system when it was designated as a paint and stencil building in the fall of 1939. The building is an 80' x 50' one-story, gable-roofed building divided in half by a concrete fire wall which extends through the roof line. Located in the area of the original Bomb Loading Plant, it is elevated on concrete piers and a loading platform wraps around all four sides of the building.

The Bomb Loading Plant was the first production plant completed at the newly reinvigorated Ogden Arsenal. In the first months of production, workers painted and labeled completed 100-pound Amatol/TNT bombs in Building 1420 immediately before packing and crating them for storage or shipment. Painting was an essential step in the production of bombs because it sealed the metal and protected bombs from rust damage. Workers marked the bombs with the lot number, date, and manufacturer using rubber stamps and lithographic quick-drying ink. They also manually painted yellow stripes on the nose and tail of bombs using small round brushes and a roller device powered with a small air motor that rotated the bomb body.

Arsenal command replaced this process in early 1941 with a safer method that required less handling of the loaded bombs. In the newer process, workers dismantled and suspended empty bomb bodies in a vertical position on an overhead, power-driven conveyor line in the Loading and Assembly Building. Workers inserted lifting devices in the tail of the bombs, which they painted with one coat of lusterless olive drab ammunition paint. The painting was done in a DeVilbiss water wash paint spray booth by using two manually operated spray guns. The overhead conveyor was designed to permit complete drying of the painted bomb bodies before removal from the conveyor by workers who then placed them on hardwood boats on a roller conveyor line. Plant staff also painted the interior of the bombs with acid-proof black paint. From the beginning, personnel focused much effort and care on the production of munitions at the Ogden Arsenal.

Munitions manufacturing became a critical aspect of the Army's mission at Ogden Arsenal just prior to the beginning of US involvement in World War II, as the entire northern half of the installation was dedicated to the establishment of several munitions loading plants and their related structures. From the end of the summer of 1941 to the fall of 1942 these plants quickly came on-line. During this period, the Arsenal developed into a major munitions manufacturing facility.

Supporting the manufacturing plants during the War was an area of moderately-sized igloo storage magazines, with two distinct types of magazines available by the summer of 1941. Buildings 1825, 1826, and 1832-1835 are Full Trapezoidal Igloo Magazines (identical to those in the 1300- and 1400-building area discussed in the "Storage and Supply" section). The other magazines (Buildings 1805, 1806, 1811-1816, 1822-1824, and 1836) are the unique Double-Sided Full Trapezoidal Igloo Magazines. These buildings are characterized by the same safety and design features as the other igloos (protective earthen mound, concrete construction, etc.), but these igloos feature a protruded entry with a recessed door on each side of the earthen mound. The west entrance wall is a full trapezoidal shape which tapers to the ground, and the east entry wall is a truncated shape. This igloo magazine area was located equidistant from the manufacturing plants for more convenient and accessible storage capacity.

The munitions manufacturing plants form a semi-circle along the eastern side of the 1800-series storage magazines. Running clockwise, and starting immediately to the north of the magazine area is the North Loading Plant, to the east are the Primer Loading Plant and the East and West Loading Plants, and due south, the East and West Fuze Plants. This area was extremely active at the height of World War II during its brief tenure of operation of just a couple years.

A key type of munitions produced at the Arsenal during this period was 37mm anti-tank ammunition. An explanation of the manufacturing process for this ammunition and how the different plants worked together will help to explain the plant buildings and their uses during World War II. First of all, one must understand the "explosive train," or the process of detonation, involved in an explosive device. The explosive train in World War II-era 37mm anti-tank ammunition was three-fold. Upon impact with a target, small fuzes (manufactured in the East and West Fuze Plants at Ogden Arsenal) detonated and ignited the primer, which, in turn, initiated the main explosion, or bursting charge, of the shell.¹

East and West Fuze Plants. To manufacture explosive components, such as fuzes for 37mm anti-tank ammunition, the Arsenal maintained a large, trained workforce. At the start of each shift, workers at these two related fuze plants reported to Change Houses. Building 1623 housed restroom, break, and changing facilities for people who worked in the East and West Fuze Plants. Since workers in these plants handled tetryl, a poisonous and highly explosive material, they needed facilities to change into and out of coverall uniforms near the plant. In order to minimize the presence of tetryl in uniforms, these coveralls contained no pockets, cuffs, or belts. Workers washed in showers with sulfur and acetone, which neutralized any tetryl left on their skin. This building

¹ Good, concise sources of information on the technical side of manufacturing US military explosive ordnance are the "Technical Background and Terminology" and "Glossary of Ordnance Terminology" sections in "Historic American Engineering Record, Picatinny Arsenal," HAER No. NJ-36, 43-56; for the explosive train in particular see *ibid.*, 50-51.

contained a common lunch room and drinking fountain hall only accessible from the exterior, as well as toilets, sinks, and showers for both men and women. The women's facilities contained approximately 675 square feet, while the men's facilities contained approximately 385 square feet. The lunch room accommodated 150 workers at a time.

Ogden Arsenal stored explosive components used in the production of 37mm anti-tank ammunition at its East and West Fuze Plants in Bombproof Shelters like Buildings 1631-1633; 1651 until they were needed in the loading lines or chemical processing buildings. These storage structures, also known as Walk-Through Igloo Magazines, have walls, floors, and roofs which are made of reinforced concrete, and the roof and side walls are covered with an earthen mound. The building consists of two concrete rooms on either side of a concrete corridor that is open on both ends to form a double-sided igloo. Raw explosive chemicals, such as tetryl, were shipped to the Arsenal by rail from outside manufacturers. These chemicals arrived packed in rubber cups, which had been placed inside wooden boxes, which in turn were loaded into wooden crates. Upon their reception, the Arsenal stored large quantities of each of these components in these Bombproof Shelters; workers transferred small quantities from these structures to individual Rest Houses for brief, transient storage before going into the manufacturing process.

As a safe place for materials in mid-process, Rest Houses facilitated the proper handling of often dangerous chemicals. Buildings 1602, 1604, 1605, 1608, 1643, and 1646, small storage sheds made of poured concrete columns infilled with the red, hollow tile characteristic of the arsenal style, served as Rest Houses for the East and West Fuze Plants. In order to ensure maximum safety and efficient production, Arsenal command instructed personnel to bring all components of 37mm anti-tank ammunition to a consistent temperature prior to assembly. Hence, personnel used Rest Houses such as these as transient storage for small amounts of chemicals like black powder, until they reached the same temperature as the next building in the manufacturing process (this usually took 48 hours). Any moisture that may have condensed on the packages evaporated during this stage. Because the storage of highly explosive elements was the purpose of these buildings, their designers used several means to minimize potential damage to surrounding buildings and workers in the event of an accident. Besides the concrete and tile construction, these buildings are surrounded on three sides by blast-deflecting earth mounds intended to deflect and absorb any shock waves that might accompany an accidental explosion.

One of the first buildings in the manufacturing process for 37mm anti-tank ammunition was Building 1603, the Tetryl Screening and Blending Building. Tetryl is a powerful explosive often used as the initiator of the bursting charge in the explosive train of many munitions.² Due to tetryl's very high melting point it was pressed into pellets rather than melted and cast. Before workers pressed the tetryl into pellets, they screened and blended it with graphite in Building 1603. This building contained a screening room on the top floor and a blending room on the ground floor. Workers accessed these two

² Ibid., 47.

levels by an indoor staircase area which also housed the equipment that powered the blending and screening machinery. In the event of an explosion, workers could escape from the second floor quickly through an exterior safety chute.

Arsenal personnel transferred tetryl to the second floor of Building 1603 from a Rest House in 50 lb. boxes. They transferred two boxes into the building at a time, each box being weighed (57 lbs. gross/50 lbs. net per box) before being opened and processed. Opening the tetryl cases with a non-sparking pinch bar, the workers then scooped the chemical out with copper scoops. They screened the tetryl through an aluminum screen into a large rubber bucket until 100 lbs. (2 boxes) was screened. Blending came next. Second-floor workers transferred all 100 lbs. of screened tetryl to the first floor, where workers placed it in a blender with graphite (100 lbs. tetryl mixed with 1 lb. graphite) for 30 minutes. To extract the blended tetryl, these workers drew out the mixed chemical from the blender into rubber cups (approx. 1 pint = 1 lb. per cup) that they then transferred to a Rest House in wooden transfer boxes by means of an explosive transfer cart.

To initiate the pelleting process Arsenal workers transferred small quantities of blended tetryl (100 lbs. tetryl mixed with 1 lb. graphite) from a nearby Rest House to either Building 1652 or 1601, the Tetryl Pelleting Buildings, in one-pint rubber cups and placed it next to the pelleting machines. Engineers at Picatinny Arsenal, the nation's premier arsenal-type facility located in New Jersey, originally designed pelleting buildings of this type, though builders at the site of Ogden Arsenal customized the structures to suit the needs of that specific installation. They constructed each building of this type of varying lengths to accommodate different pelleting functions and equipment. Due to the high volatility of tetryl and other chemicals, this building, like many others at Ogden Arsenal, was designed in the arsenal style, with concrete fire-walls that extend through the roofline separating all rooms housing explosives manufacturing work. This concrete skeleton supports exterior walls constructed of lightweight, hollow tile blocks engineered to absorb and deflect the force of an explosion outward, away from the rest of the building. The broad hip-roof overhang provided workers with shelter for circulation between rooms. In these buildings, Arsenal personnel utilized pelleting presses converted from pharmaceutical uses to produce pellets with a consistent size and density that could be easily loaded into fuze bodies in the Fuze Loading Buildings (Buildings 1642 and 1607).

Before the pelleting workers entered the workroom to begin operations they turned on the master switch and machine switch located just outside of the building. Before processing a load of tetryl, specialized personnel inspected the pelleting presses to be sure the hopper was 1/2" above the table, and the powder frame had the proper clearance (.064). They checked the belt and ground wire every other run, and workers greased and oiled the complete machine once daily. Besides these important maintenance activities, they tested pellets for accuracy once an hour. To accomplish this test they placed one pint of blended tetryl in the hopper and ran the press for 20 seconds. An inspector examined these test pellets, and then ordered any adjustment for height or

weight of the pellet necessary (except an adjustment of the pressure plate, which was only adjusted by the foreman).

During production, workers ran the pelleting press for 2 1/2 minutes per pint of blended tetryl to yield 250 pellets. They placed four cups (250 pellets each) in a rubber bucket and transferred them to a Rest House before taking them to Building 1642, the Loading & Assembly Line Building. Tests were taken (10 pellets per test) from every other pint of tetryl processed. Inspectors gauged the pellets for accurate size and weight, each pellet being required to weigh between 26 and 27 grains and to fall between .442" and .447" in height).

Drawings or specifications directing the manufacture of different types of ammunition did not accompany many of the orders received for their manufacture, so individual production sites became responsible for the invention, development, and modification of various types of machine tools like the pelleting presses used in Buildings 1652 and 1601. Some of the presses used in shaping tetryl pellets in these buildings had been converted from presses procured from pharmaceutical companies which used the machines to manufacture pills and other medications. These presses did not contain punches suitable for processing explosives, so machinists made special punches of the type, shape, and form required in the machine shop at Ogden Arsenal. In some cases, Arsenal personnel even developed the machinery needed to make the punches themselves.

Serving as a storehouse for non-explosive supplies used in the fuze manufacturing process, Building 1621, the Inert Component Warehouse, supported operations at the main Loading and Assembly Line Buildings (1607 and 1642) during World War II. The Arsenal received inert components from manufacturers outside the installation and stored those items related directly to fuze production in Building 1621, in order to readily supply fuze plant operations with casings and other metal parts used in fuze assembly. Buildings 1607 and 1642, along with Building 1609, a small concrete/hollow tile structure which provided inspection and testing facilities, each provided space in which workers completed production of fuzes for 37mm anti-tank ammunition. Workers disassembled, inspected, and reassembled fuze bodies with tetryl pellets in these buildings.

Although components used in the loading and assembly of 37mm shells had been inspected before shipment to the Arsenal, it was found that further inspection of critical items like fuze bodies prior to loading increased efficient production in the loading operation. Building personnel measured all dimensions of a representative sample of the inert fuzes and checked the threads and recesses of the casings before loading them with tetryl pellets made in Buildings 1652 and 1601. Also prior to loading the tetryl, they stamped fuze bodies with the lot number, date, and manufacturer. The Arsenal obtained basic stamp presses (which did not include the stamps themselves) from private manufacturers and had them modified in the machine shops of Ogden Arsenal. Separate manufacturers provided the various stamps, since the Arsenal lacked facilities for cutting certain types of stamps and stencils.

After disassembly and initial inspection, workers in Buildings 1607 and 1642 secured tetryl pellets in the closing caps of the fuzes with aluminum discs and then

screwed those onto the fuze bodies, which each contained a firing pin and detonator. Finally, workers sealed the fuzes with glue. Once again, however, workers in Building 1609 inspected samples of completed fuzes as a final check in the process. Back in the Loading and Assembly Line Buildings, workers packed completed fuzes in fiber containers (50 per container) and placed them in wooden packing boxes (8 per box). They then transferred loaded skids of fuzes to the Arsenal's main loading plants for assembly into complete rounds of 37mm anti-tank ammunition.

Primer Loading Plant. The Primer Loading Plant did not become operational until the summer of 1942. Therefore, in the first few months of munitions production, when only the main loading plant buildings were operational, the Arsenal shipped in completed primers from outside manufacturers. Once production began at the Primer Loading Plant, however, it made all the primers used in munitions manufacturing at the Arsenal.

As an initial step in the Primer Loading Plant's operations, workers screened and blended black powder in Building 2002. An electric motor, located in Building 2003 just seven feet to the east of Building 2002, powered the equipment used in this process. Black powder, the explosive ingredient used in primers for 37mm anti-tank ammunition, is sensitive to impact, friction, and sparks. Thus, the Motor House (2003) was detached from the Black Powder Screening Building (2002) to prevent sparks from igniting the black powder while personnel processed it. Black Powder is an explosive mixture of potassium nitrate, sulfur, and charcoal. Workers finely ground these elements, screened them through aluminum sieves, and then blended them together in Building 2002. Using copper scoops, the workers next poured the blended black powder mixture into one pint rubber cups that they then placed in wood explosive transfer boxes. Personnel used explosive transfer carts to transfer these boxes from Building 2002 to a Rest House (Buildings 2001 or 2006).

After it reached an adequate temperature in a Rest House, workers transferred the black powder to the Black Powder Dry House (now demolished). In the Dry House, workers compacted loose black powder in rolling mills and then pressed it into cakes using hydraulic presses. Next they broke the cakes and classified them by grain. Finally, they polished the resulting granules with graphite, which allowed the mixture to be freely poured into primer bodies in the Primer Loading Building (Building 2014). Due to the highly volatile nature of black powder, these buildings were designed in the arsenal style. Originally, Arsenal personnel coated the interior walls of the buildings with "Keene's Cement," a hard, white, high-strength plaster made by adding alum to burning gypsum. These structures were designed and maintained with the safety of workers as a key concern. The protection of the installation's munitions production capacity, which would be jeopardized in the event of a major explosion, also provided a driving motivation for including significant safety and explosion control measures in the construction of these buildings.

Building 2024, the Inert Component Warehouse, played a part in the manufacturing process at the Primer Loading Plant. The Arsenal stored inert ammunition

components used in the production of primers in this standard 220' x 50' warehouse. During the War, Ogden Arsenal shipped in metal parts such as cartridge cases, projectiles, and primer bodies from outside manufacturers in a finished state. All items from a common lot number were stored together and transferred to the loading lines (Building 2014, described below) in small quantities as needed.

Final assembly of the primers for 37mm ammunition occurred in Building 2014, the Primer Loading Building. Each primer contained a "blasting cap" which workers placed inside a cylindrical aluminum capsule. They filled blasting caps with black powder from the Dry House. After loading and sealing blasting caps in smaller rooms, workers transferred them into a large, open, column-free space for final assembly and packing. Personnel in Building 2014 utilized the south end of the building for storage, bathrooms, coat rooms, and an office. Ultimately, primers assembled in Building 2014 ended up in other loading plants at the Arsenal (i.e., the North, East, or West Loading Plants) where personnel placed them into rounds of 37mm anti-tank ammunition.

North, East, and West Loading Plants. The main loading plants were the sites of the final assembly of the complete rounds of the 37mm ammunition manufactured at Ogden Arsenal. Integrating the products of the other munitions plants at the Arsenal (fuzes and primers, the first two elements of the explosive train), the operations of these plants provided the culmination of the efforts of many dedicated, hard-working people.

Of the many buildings at these main loading plants the nearest ones to a "nerve center" of operations were the Field Office Buildings. These facilities (Building 2101 is representative) contained offices for the loading plant superintendents, foremen, and inspectors, as well as a small classroom and storage area. The main administrative area of the Arsenal was located in the General's Loop area, far away from the loading plant areas. Buildings like 2101 allowed those who directly supervised plant activities to remain close to the production area, and thus keep operations running more efficiently and productively.

Bombproof Shelters (Buildings 2107, 2108, 2131, 2132, 2138, 2206, 2207, 2231, 2232, and 2238, also referred to as Walk-Through Igloo Magazines), similar to those in the East and West Fuze Plants, were built in the Arsenal's main loading plants to store explosive components, such as primers, fuzes, and raw chemicals used in the making of 37mm anti-tank ammunition. These materials remained there until needed by workers in the loading lines or chemical processing buildings. Workers brought primers and fuzes, manufactured in their respective plants elsewhere at the Arsenal, to the loading plants by rail. Outside manufacturers shipped raw explosive chemicals, including tetryl, phosphorus, and strontium, to the Arsenal by rail, too. Workers usually packed these chemicals in rubber cups placed inside wooden boxes and then finally loaded these boxes into wooden crates for shipment. Arsenal personnel stored large quantities of each of these dangerous components in the Bombproof Shelters and transferred small quantities to individual Rest Houses (like Building 2001) for transient storage (usually 48 hours) until they reached the same temperature as the Assembly Line and Loading Buildings (like Buildings 2214 and 2213) or chemical processing buildings (like Building 1948).

These igloo-style Bombproof Shelters are covered with an earthen mound and separated from surrounding buildings by open land. A concrete apron with a sharp slope upward from the entry made fork lift operations outside these igloos a difficult task, so workers loaded all items by hand until 1943. That year, a process was developed that kept automatic electric fork lift trucks with combination forks inside the igloos while a conveyor track was laid from rail cars or trucks into the doorway. This new process saved approximately one half the time previously used by hand loading alone, with only half as many workers. Located very close to the munitions manufacturing facilities, these structures proved important to the overall efficiency of the loading plants by allowing quick access to large amounts of ammunition components.

Other storage facilities situated among the manufacturing buildings, and significantly supporting their operations, were the Inert Component Warehouses (Buildings 1910, 1913, 1919, 2111, 2112, 2211, 2212). These large, standard warehouse structures served the same capacity as the warehouses in the fuze and primer loading plants described above. They provided accessible storage space for ammunition components such as cartridge cases and projectiles, as well as packing materials for the completed rounds. When these parts were needed in the main assembly buildings workers transported them to these nearby sites. In this way, the Inert Component Warehouses played a significant role in the munitions manufacturing process at Ogden Arsenal. As in the other plants, multiple Rest Houses served as places of transient storage for explosive components while in process. Providing storage space as well, Smokeless Powder Magazines were located at each separate loading plant (Buildings 1932, 2135, and 2237) and held high explosives, primers, and igniter cartridges.

Loading plant personnel, as with other Arsenal workers, reported to Change Houses (Buildings 1901, 1902, 2201, and 2202) both as they came on a shift and as they prepared to go home. Since workers in these plants handled smokeless powder and tetryl, poisonous and highly explosive materials, they needed facilities in which to shower and to change into and out of government-issued protective clothing. Typically, personnel used two different Change Houses in each individual plant. Buildings 1902 and 2202 served workers who washed with a sulfur solution to remove poisonous chemicals from their skin, while Buildings 1901 and 2201 provided places for workers who did not handle chemicals that required them to wash with sulfur. Besides showers, sinks, and toilet facilities, these buildings contained a common lunch room and drinking fountain hall.

Once clothed properly for the dangerous work of manufacturing munitions, workers dispersed to their separate buildings to perform their specific tasks. Personnel in Buildings 1946, 1948, 2148, and 2248 prepared chemicals needed in the production of munitions. The design of these structures directly reflects the processes that occurred within their walls. Building 1948 served as a tetryl screening and blending facility identical to Building 1603 in the West Fuze Plant discussed above. Workers prepared the tetryl and blended it with small amounts of graphite so that the mixture could be shaped into pellets in other plant buildings. A two-story, gable-roofed structure, Building 1948 is framed in concrete, with a concrete wall separating the interior open stair from the

screening rooms. The walls, reflecting the arsenal style, are infilled with red tile. For extra worker safety, an emergency slide extends from the second-floor balcony to the ground on the north side for rapid escape in the event of an accident. Given the volatility of tetryl as an explosive chemical these protective measures are understandable.

The Tracer and Igniter Composition Buildings (Buildings 1946, 2148, and 2248), as places where workers prepared tracer and igniter chemicals for 37mm anti-tank ammunition, also reflect these arsenal style design elements. Measuring 30' 4" x 80' 4", these one-story, hip-roofed structures are composed of a series of individual rooms separated by concrete fire walls and hollow tile infill bricks. The fire walls extend up through the roof and step down as the roof slopes to the north and south, maintaining a slope parallel to the roof pitch. The buildings are bisected lengthwise down the center, with two separate chemicals traveling through the them from north to south. Phosphorus, the tracer component, left a smoky and luminous trail behind the 37mm shell as it flew through the air toward its target. Strontium, the igniter component, ignited spontaneously in air when the force of impact from striking the target dispersed it into fine particles. This caused a secondary fire that supplemented the initial impact of the shot. Workers brought small amounts of these chemicals to Buildings 1946, 2148, and 2248 from nearby Rest Houses.

Arsenal workers confined and processed phosphorus in the west rooms, while they prepared strontium in the east rooms. They kept small amounts of each chemical stored in the two northernmost rooms, and transferred them into adjacent rooms where they were separately weighed, screened, and dried. Arsenal personnel then blended the chemicals together in the two southernmost rooms of the buildings. Since this was the most dangerous and erratic step of the process, these two rooms were separated from the rest of the building by an open passage that served as a buffer between the blending operation and the screening, weighing, and drying processes. One large blending machine was used in each of these blending rooms. A single industrial electric motor placed between the two blending rooms, which were separated by concrete firewalls to protect the blending operations from possible sparks, powered the machines. Since climate control was a crucial component in this process, one large room in the building was dedicated to air conditioning and ventilation equipment. The design of these single-story buildings thus revealed a significant consideration of safety.

The Pelleting Buildings (Buildings 1941, 1943, 2141, 2142, 2241, and 2242) housed workers who pressed tetryl and blended phosphorus/strontium compound separately into pellets using the same methods and machinery as described previously for Buildings 1652 and 1601 in the fuze plants. Arsenal personnel then transferred the pellets to the Projectile Loading Buildings (Buildings 1917, 2113, and 2213), long, one-and-a-half story, warehouse-type structures where, after disassembling and inspecting inert ammunition bodies, other workers loaded the tracer and igniter pellets along with the bursting charges into 37mm shell casings.

In late 1941, workers at Ogden Arsenal developed an initial assembling and crimping machine for 37mm ammunition. The machine pressed the projectile into the cartridge case with a 4-stab crimp. Compressed air was used to actuate the manually

operated machine. These first shells were easily knocked out of alignment during battle, though, since they were only crimped at four points. The need for a continuous crimping machine quickly became evident. Personnel at Ogden Arsenal modified the 4-stab model machine in use and converted it into a continuous crimping machine, which crimped the casing around the entire shot. Such a continuous crimping machine was available commercially for about \$7,500, but the Ogden Arsenal machine shop modified the machines already in use for \$200-300 each.

Arsenal workers again inspected partially completed 37mm anti-tank ammunition in the Projectile Loading Buildings prior to sending them elsewhere. Each armor-piercing shot was submitted to a 1,000 pound dead weight test after workers loaded the tracer and igniter charge. Machinists assembled a dead weight test machine at Ogden Arsenal which had a capacity of 1,000 pounds and could perform the test on 37mm shots. This machine tested the security of the solder connection of the cap of the shot to the body. The inventive personnel of the Arsenal also developed a complete round breakdown machine to facilitate the process of dismantling a complete round of ammunition for testing and inspection. This machine was constructed to safely and quickly disassemble a complete round of 37mm ammunition. These machines facilitated the work carried on at this important stage of the munitions production process.

Following the final inspections at the Projectile Loading Buildings, workers transported the partially completed shells over to the Assembly and Loading Line Buildings (Buildings 1915, 2114, and 2214), the main, and final, munitions assembly facility of each separate plant. These buildings are perhaps some of the most interesting structures from the World War II-era at Ogden Arsenal. Due to the highly volatile nature of the chemicals used in 37mm shells, this building was designed to allow minimal damage to adjacent rooms (and workers and equipment) in the event of an explosion in one room. Each room is separated from the others by concrete fire walls that extend a few feet beyond the roofline, and each room is accessible only from the exterior. An outdoor balcony along the east facade allowed workers to circulate between rooms on the upper floor. An elevator, added on the east side exterior in 1945, facilitated access to upper level rooms in the central bay. Each room contains an exterior door that is large enough to accommodate forklift trucks and pallets.

Immediately before packing loaded and assembled shells, workers in the Assembly and Loading Line Buildings gauged the completed rounds 100% for alignment. Due to the heavy weight and awkward shape of the completed shells, the Arsenal seldom employed women in this capacity. To overcome these difficulties, command had a 37mm profile and alignment gauge ejecting fixture designed which made the job relatively simple, and blind male operators performed this operation! The fixture consisted of a gooseneck bracket with attached lever. A replaceable fabric composition head was machined to fit in a steel socket on one end of the lever. This fixture mounted on the gauge in such a manner that it had no bearing upon the gauging operation itself, but its effect was put into use in the ejecting operation. The device increased the speed of this part of the inspection operation and made an awkward task much more manageable.

In these important buildings, workers placed completed rounds of 37mm ammunition inside cylindrical fiber containers and attached a cover. They next submerged these closed containers in wax for sealing before placing them in shipping containers. The joint left between the cover and the container before the waxing process necessitated the development of a process to tape the cover to the container before waxing. Arsenal personnel developed a device which completed a more skilled and much faster job than could have been done by hand-taping alone. In early 1942, technicians developed a special machine for dipping the complete rounds in paraffin after they had been sealed in fiber containers. This machine processed about 125 rounds per minute and was much superior to the former practice of hand dipping. Completed and packed rounds of ammunition were shipped by rail to storage igloos in other areas at Ogden Arsenal. The Arsenal originally placed the Assembly and Loading Line Buildings of these plants along existing rail lines to facilitate their function as ammunition shipping points.

Many people in many diverse buildings worked together during World War II at the hazardous and detailed task of producing ammunition for the American war effort. The fruit of their labors was a well supplied army, one better able to fight multiple foes all over the world. The role played by Ogden Arsenal as a munitions manufacturing facility was short-lived, beginning in 1939 and lasting only until late summer of 1943. However, the work that took place in the buildings of the Arsenal impacted not only the workers and the local community, but significantly aided the United States in its struggle for victory in World War II.

RESIDENTIAL AND ADMINISTRATIVE AREAS

With its revival in the late-1930s, Ogden Arsenal took on more personnel, so the installation needed space to house officers and their families. In 1939, besides a rear addition to the Hobson House, several Family Quarters (Buildings 1106, 1110, 1114, 1120, 1122, 1130) were constructed near this main administrative and residential building in or near the area that would become known as the General's Loop. Buildings 1106, 1110, and 1114 are elegant single family houses designed for the families of upper-level officers who were needed to supervise the Arsenal's manufacture and storage missions in support of US Army operations before and during World War II. These buildings contribute to an understanding of the inherent hierarchy among military workers, since officers lived in more spacious and elegant quarters than enlisted men. These two-and-one-half story Colonial Revival houses were constructed of red brick and show Georgian stylistic influences such as brick quoins at the corners and classically elaborated entryways. They are located on the south end of a common formal lawn that embraces a distinctly suburban ambiance shown in its lush landscaping, private patios, spacious yards, and curving drive. This area is fully detached from the industrial munitions storage area to the north and east, and thus served as a pastoral retreat from the Arsenal's predominantly industrial areas.

Buildings 1120, 1122, and 1130 are examples of multiple-family housing designed for the families of upper- and mid-level, non-commissioned officers at Ogden

Arsenal. Also built in the Colonial Revival style, Buildings 1120 and 1122 are identical, two-story, red brick duplexes with specific elements of the Georgian style, located down the street from the Hobson House. Building 1130, a long, rectangular, brick four-plex, is a structure with an eclectic mixture of Colonial Revival and Arts & Crafts stylistic influences situated to the northwest of the General's Loop. It is symmetrically arranged, with two units located to the north and two to the south of a central axis. The doorways are grouped together in pairs and adorned with short, flat projecting roofs supported by decorative wrought iron supports. The building has one long gable roof with four shed-roof wall dormers centered above each unit. Housing for civilian and military personnel (both on and off the Arsenal) was a critical issue throughout the World War II years, and reflected the major role that the installation played in bringing people to the area and developing the local economy.

Building 1124 renders a unique picture of medical care and residential life for non-commissioned officers's families at Ogden Arsenal during the US Army build-up of the late-1930s and 1940s. This building, the Post Dispensary, originally housed the medical facilities provided for the workers at Ogden Arsenal. It is a rectangular, two-story, Colonial Revival duplex with a red brick exterior located directly across the street from the Hobson House in the prestigious General's Loop area. The hip roof is accentuated with a wooden cupola and decorative finial at the center of the building along the ridge. The front entrance features a simple projecting porch supported by slender, round wooden columns and two doors. When the Dispensary was relocated in 1943, Building 1124 was converted into a residential duplex for non-commissioned officers and their families.

With US involvement in the War, and Ogden Arsenal's increased and expanded role in the war effort, the installation needed new administrative facilities. An addition to the original administrative center, the Hobson House, in 1939 was not enough to handle the avalanche of personnel and activity at the booming installation. Building 1102 was built in 1943 to be Ogden Arsenal's "new" headquarters. This Headquarters Building was constructed out of red brick in order to maintain the character of the preexisting officers's housing area known as the General's Loop. The building shows elements of the Colonial Revival style which are consistent with the adjoining neighborhood. It is a large structure arranged in a symmetrical composition with a dominant, though simplified, temple-like central block flanked by two identical wings. The central portion projects from the rest of the building to receive ceremonious grand entry stairs. This front entrance faces due north, toward the ordnance areas. The hip roof has four arched dormers on the north side and eight on the south side. A wooden cupola sits along the ridge line, on axis with the entrance, further elaborating the building's symbolic function as the center of operations at the Arsenal.

STORAGE AND SUPPLY

Through the course of military preparation for and involvement in World War II, Ogden Arsenal went from a place for more or less long-term storage of mostly obsolete materiel to a busy distribution facility dealing with a full range of military supplies and

equipment by the height of the conflict. Munitions storage facilities ranked as the Arsenal's top priority for construction during the late-1930s. At this time, the military built and used several different types of structures for the storage of high explosives, ammunition, and other sensitive military materiel. One type of storage building was the igloo magazine, which included at least two varieties: full and truncated trapezoidal igloos, in reference to the shape of their front elevations. In 1938 and 1939 a large number of these storage igloos were completed on a sandy-soiled area (the 1300- and 1400-building area) east of the Arsenal's main residential, administrative, and service areas, and put to use storing explosive ordnance.

Construction of other storage facilities began in 1940 directly to the south of the main residential and administrative area. The "40-Warehouse" area, later called the "Warehouse area" as it grew to include many new warehouses, served as the Arsenal's General Supply Depot throughout World War II. The Arsenal command had many buildings erected as part of the first wave of warehouse construction in 1940 and 1941. A second wave of construction at the Arsenal occurred in 1942. Several major types of warehouses occupied this area, all of similar design and construction (concrete or brick walls) and measuring approximately 60' wide and between 200' and 700' in length with the different lengths accomplished by the addition of identical 20-foot long bays. Personnel further categorized the warehouses into "Type A" (with two offices at one end) and "Type B" (completely open storage plan).

Initially, these warehouses held inert ammunition components and empty practice bombs. When Pearl Harbor was attacked, twenty-eight of these original warehouses stored approximately 1 million empty practice bombs; the others stored inert components for the manufacturing of 37mm ammunition. In some cases, workers had to place materiel in these warehouses before completion of all roofs and electrical outlets, the Army was in such dire need of storage space. As World War II progressed, general supply demands increased dramatically. As a result, on March 1, 1942, 15 men were employed in the Warehouse area; by August 1, this number increased to 125 men and women.

Arsenal officials modified storage methods in these warehouses in 1942 to maximize efficient use of available space. The warehouses became equipped with bins, shelving, and handling equipment for both retail and wholesale circulation of general supplies. In 1943, for instance, command designated Building 1245 one of 17 bin storage warehouses, which required significant alterations to the interior (other warehouses of this type included Buildings 1227, 1228, 1238, and many others). Workers soon insulated the ceilings of all bin warehouses, and installed heating equipment, adequate lighting, and toilet facilities. To facilitate proper storage in each warehouse, they further erected prefabricated bin tiers into sections and built mezzanine decks on top of the sections to be used as reserve location areas for storage and reserve stocks for replenishing bins. Rod racks were built on the mezzanine floor for storage of bulky and odd sized items such as exhaust pipes, fenders, etc. Workers with mechanical fork lift trucks and wooden pallets accomplished all stacking in these modified warehouses. Besides designating bin storage warehouses in 1943, the Arsenal also designated 31

bulk/reserve stock storage buildings (examples are Buildings 1229, 1239, 1268, and 1295 among others). Often in this highly active period of the War, personnel had to quickly modify warehouse buildings to suit the developing needs of the American war effort.

Each warehouse was accessible by rail from one side and by truck from the other. Large overhead doors on both long sides of the buildings facilitated the circulation of goods on either side. Concrete loading docks line the entire east and west facades. These loading docks provided temporary additional storage space (800 square feet per warehouse) when needed. Upon conclusion of manufacturing at the Arsenal near the end of the summer of 1943, receiving, storing, and shipping of war materiel took center stage. The Arsenal became a major hub for the Army's West Coast supply depots, handling equipment as diverse as tanks, tractors, weapons like small arms and artillery guns, as well as other miscellaneous parts and supplies. Long-term storage operations were secondary as the Arsenal became more or less a distribution center supplying busy West Coast military operations. Ogden Arsenal served in this capacity through the remainder of the War until, following the end of conflict in Europe and the Pacific, a newer facility, Utah General Depot in Ogden, assumed most of the supply operations that had previously been held at Ogden Arsenal.

ORDNANCE RECLAMATION

In addition to storing and shipping items, Ogden Arsenal became a major post for reclamation of damaged but serviceable ordnance components and metal products. This activity mostly took place in the Warehouse area of the Arsenal during World War II. Ogden Arsenal received battle-weary weapons such as artillery guns, Howitzers, and mortars, machine guns, pistols, rifles, and various other smaller ordnance equipment returned from the field in damaged condition. Beginning in 1944, the Receiving Branch (located in Buildings 1248 and 1258) received and evaluated these items and transferred serviceable items needing minor repair to places such as Building 1622, the Small Arms Shop and Warehouse, where workers reconditioned them. These items were then returned to the warehouses where workers inspected, cataloged, and either stored or issued them back to the field for re-use.

Arsenal command designated Buildings 1243 and 1253 as ordnance repair shops, and they played a large role in reclamation activities. These structures (60' x 302') feature a tripartite configuration that consists of a two-story central space flanked by full-length, single-story wings. The roof structure of the central portion is gabled with steel-truss supports, and continuous clerestory windows light the central space. The buildings contained open shop space, supply and tool rooms, and offices. Railroad tracks ran through the center space in order to facilitate convenient loading and unloading of ordnance components. Reclamation workers unloaded these items, repaired them on site whenever possible, reloaded them into rail cars, and finally transferred them to other storage warehouses at the Arsenal.

Some other warehouses specialized in function as well, offering space for various tasks of the ordnance component reclamation work. Building 1285 was a repair shop for small mechanical (clocks and watches) and optical components (binoculars, aiming

circles, and gun sights). The building appears to be composed of two 200' long warehouses attached end to end, with a two-bay, two-story section at its northern end. This two-story section was added to the standard warehouse's north end in 1943, just one year after the building's original construction. This section housed a mezzanine-level observation room for monitoring optical equipment that was housed on the lower level. A wood-frame observation platform, which has subsequently been enclosed, stood on concrete columns to the north side of this two-story portion. Building 1285 is a unique structure in the Warehouse area.

TRANSPORTATION

Transportation was crucial to supplying the American war effort. Since most goods shipped into and out of Ogden Arsenal traveled by rail, railroad tracks became a common fixture upon the Arsenal's landscape. When Ogden Arsenal was first built in the 1920s, Union Pacific tracks already graced the site. Additional spurs were linked to existing lines and a self-sufficient railroad depot (Building 1132, discussed above) was built to service the Arsenal during the years immediately preceding World War II. With the Arsenal's expansion at the beginning of the War, a need for additional locomotive repair facilities rapidly arose. By 1942 a new locomotive repair shop or depot was ready to be utilized in the repair and maintenance of engines and cars during the Arsenal's extremely active years following the attack on Pearl Harbor.

During World War II, the depot ran trains for immense delivery and shipping purposes. The original building contained 12 bays lighted by clerestory windows in a three-gable butterfly roof. The eastern four bays contained a large shop and a two-story administration area at the northeast corner. This corner housed bathrooms and storage areas on the first floor and offices on the second. The remainder of the structure contained the engine room with eight separate locomotive repair bays each with individual tracks. This room contained two levels, with a catwalk mezzanine around the perimeter of the room. This area was accessible on the north side of the building through large steel rolling-type doors over each track. Two of the eight bays were originally equipped with pits and overhead cranes. The pits provided workers accessibility to equipment on the underside of locomotives, while other personnel used the overhead cranes to hoist out heavy or awkward parts from the locomotive. Workers removed parts from the locomotive and repaired them in the adjacent machine shop workroom. During World War II, the depot repaired eight to twelve locomotive engines each year. When the War ended and the manufacture of bombs locally ceased, the depot no longer needed to assist with the task of exporting munitions. Thus, the depot became exclusively a repair station, with operations focused in Building 1701.

Another structure associated with the vast network of railroad tracks upon which the Arsenal relied to transport supplies and munitions during World War II is Building 1148, the Railroad Scale House and Scales. This small Scale House, constructed entirely of concrete, operated as a post of sorts amidst this network of tracks. Located just to the north of the Warehouse area, this tiny building contains a single observation room used during the War to monitor the weight of locomotives and cars on five separate tracks

running nearby. It is elevated above grade so the attendant could access train engines without climbing up to them from ground level. The remains of one weighing scale are located approximately four feet west of the station, and railroad ties are strewn all around the site. When the Army no longer needed the railroad as a primary form of transporting military goods, they virtually abandoned this building and others like it.

SUPPORT BUILDINGS

Several structures throughout Ogden Arsenal played a support role, providing necessary services to the installation on a regular basis. Prime examples of this are the Boiler Houses which provided heat for many areas of the Arsenal. Each distinct area or plant at Ogden Arsenal contained its own heating facility. Building 1286 serviced the Warehouse area; Building 1703 serviced the Locomotive/Transportation area; and Buildings 1624, 1904, 2025, 2104, and 2203 heated their respective munitions manufacturing plants. The Locomotive and Warehouse boiler's original heating equipment included two 200-horsepower Union Iron Works boilers, one 500-horsepower Keeler boiler, and a 160 psi pressure semi-automatic, gas-fired water tube that featured a hand-fired oil standby. The munitions plants's original equipment was not as powerful, consisting of two 121-horsepower Union Iron Works boilers and a 25-psi pressure, water tube, gas-fired, semi-automatic, hand-fired oil standby. This equipment came complete with all controls, meters, gauges, steam pumps, oil pumps, valves, stacks, breachings, blow downs, etc.

The Army considered life-saving and fire-fighting facilities a necessity for the proper functioning of Ogden Arsenal, and particularly its munitions manufacturing plants. Dispensaries and Fire and Ambulance Stations, like Buildings 1626 and 1627 in the East and West Fuze Plants, provided just such a safety service. Since workers in these plants handled such dangerous chemicals as tetryl, a poisonous and highly explosive material, injuries due to explosions or toxin exposure were common, even when the utmost precautions were taken. In order to respond immediately and minimize losses, the Arsenal established Fire and Ambulance Stations, which housed emergency intervention equipment like fire trucks and ambulances, and staffed it with emergency workers who were on call 24 hours a day. These stations contained a fire engine stall, an ambulance stall, office, and living quarters for firemen and an ambulance driver. The workers shared a common kitchen and toilet facility, but their sleeping quarters were separate from each other. The ambulance driver slept in a room that adjoined the ambulance stall, while the firemen slept in a room adjoining the fire engine stall. To further promote safety at the plants, a Dispensary was placed on site and staffed with nurses trained to give emergency care to workers of these areas. Arsenal command located the main Dispensary (Building 1124, mentioned above) in the General's Loop area, too far away from the munitions plants to provide adequate emergency care to workers. Enabling emergency workers to respond immediately to worker injuries, these facilities offered security and protection for the people and buildings of the Arsenal's munitions plants and other important areas.

Another building serving a peculiar purpose at the Arsenal is Building 1367, located on the southern edge of the main Magazine Storage area. It served as a dunnage and equipment shed, contributing to Ogden Arsenal's task of handling both retail and wholesale issue of general supplies to the US Army. Building 1367 was originally used to store dunnage, or loose packing material used to protect rail cargo from damage during shipment. Arsenal personnel used the dunnage stored in Building 1367 to protect ordnance materials, and typically laid it beneath and wedged it around wooden pallets or wire-bound crates that were being transported by rail. Dunnage was not loaded for long-term shipment directly from Building 1367; personnel transported it from this building to either the Warehouse or Magazine Storage areas, where workers unloaded it and then packed it around cargo.

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